# THE RENEWAL OF LIFE

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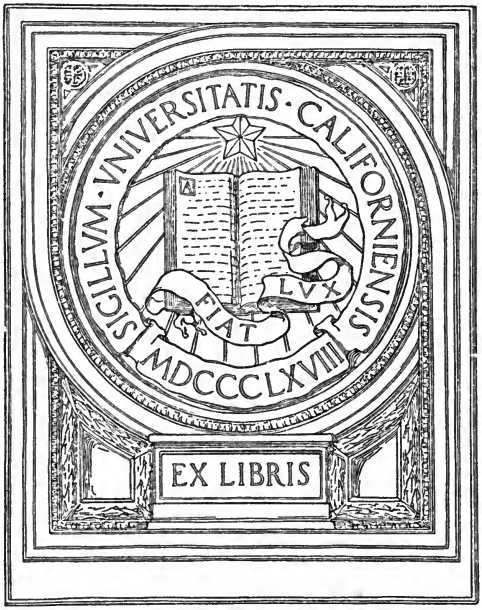

# The Renewal of Life

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*How and When to Tell the Story to the Young*

By

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Illustrated




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## *How and When to Tell The Story to the Young*

### I

### THE RENEWAL OF LIFE

EVERY human being must sooner or later know the facts concerning the origin of his life on the earth. One of the most puzzling questions is how and when such information should be given to the young.

There is nothing the parent more desires than that his child should have a high ideal in regard to the sex-life and that he should live in accordance with that ideal, yet nowhere is careful and systematic education so lacking as here.

What parent would allow his child to go untaught in the particulars concerning truth-telling, honesty, cleanliness, and behavior, trusting that in some way the

child would discover the facts necessary to the practice of these virtues and live accordingly? And yet with apparent inconsistency one of the prime virtues is neglected; one of the most vital needs of every human being — the understanding of his sex-nature — is too often left entirely to chance. Not only is the youth uninstructed, but no proper way of learning the truth is within his reach. It is as though he were set blindfold in the midst of dangerous pitfalls, with the admonition not to fall into any of them. Those who ought to tell the facts will not, consequently the facts must be gathered from chance sources which are too often bad, poisoning mind and heart. Even the physiologies, with the exception of those large, and to the average reader inaccessible, volumes used in medical schools, scarcely ever touch upon the subject. Of course these larger books give only the physiological facts couched in scientific terms. How and where, then, can the youth learn what he needs to know?

It is true there is a noble effort being made for young men, and to a less extent

for young women, by certain organizations that exist for the help of the young, to supply this curious defect in our educational system; but these efforts reach but comparatively few members in a community, and come too late in the life of the young to give them their first impressions on the subject. Perhaps the most encouraging sign for the future is the interest that thousands of mothers in all walks of life are to-day taking in the best methods of training their children to a right understanding and noble conception of sex-life. Innumerable mothers' clubs give the subject a place in the curriculum of the club work, at stated times discussing, reading, consulting all available authorities which may be of help. Some of these mothers live in poor homes in neighborhoods where their children are exposed to all sorts of evil communications and temptations. Others have sheltered homes, from which the children go out among refined associates from whom there may be little danger of learning that which is evil. Yet others live in moderate circumstances, where the home influences

may be good, but where the children are liable to mingle with a heterogeneous society in their school and perhaps in their social life.

Moreover, in all these homes there are children of different natures, — some with temperaments which make it easy for them to imbibe harmful information, while others as naturally resent such information.

Nor is the child of rich parents living in a costly home necessarily the child least likely to make mistakes. The facts quickly refute any such idea. It is the child most carefully trained at home, with the most inspiring counsel and the wisest guidance in all directions, who has the best chance for successful living, the child whose parents not only secure the best outside assistance where such is necessary, but who themselves take a vital and continuous interest in his education. Such parents, where the help of nurses and teachers is necessary in the home, see to it that these helpers are wholesome, high-minded companions for the growing minds put under their charge.

The poorest child is the child of wealthy parents, who is turned over to hirelings, chosen more for their accent of a foreign tongue than for their knowledge of child life and of the laws which govern the growing mind and body. Such children not infrequently become as depraved as the most neglected and exposed child of the slums, later poisoning the minds or shocking the sensibilities of children in the schools they attend.

One of the difficulties every mother has to encounter is the presence of undesirable companions in the school. The argument that a child coming from a sheltered home will not be influenced by such companions is only in part true. He may not be influenced, or, again, he may. Among older children, if the wrongdoer be dazzling in manner, looks, social position, or even in power to lavish money, he will acquire a certain ascendency over many of his companions, who, if not safeguarded against his allurements by a clear knowledge of the facts of life, may fall into his snares.

How, then, can all these various

situations be dealt with? How, how much, when, and where shall the youth be safeguarded against influences, misconceptions, and mistakes which may mar his whole after-life? These are the questions which in part this book endeavors to answer.

The answers come from the writer's experience of many years' work with mothers interested in this subject, especially from the testimony and the questions of thousands of such mothers in all walks of life who possessed children of all temperaments.

The book is not meant to be either exhaustive or arbitrary. It is written with the single desire of helping the mother who may be groping her way in this matter, its aim being twofold,— to indicate methods of procedure among which the mother may find one adapted to her special needs and circumstances, or at least from which she may get hints which she can herself follow in her own way, and to indicate sources of information.

One trivial difficulty has presented itself in preparing the succeeding chapters,

and that is the lack in the English language of a pronoun including both genders. The English impersonal pronoun, being masculine in form, is liable to create the impression that "he" or "his" exclusive of "she" or "her" is the subject of discourse. This is not so. Generally the masculine pronoun is used impersonally in this discussion, and the discerning reader can easily decide from the context where this is not the case.

As a help to the busy mother in selecting books for herself and her children, a list is given at the end of the book. This list is by no means exhaustive. There are many other and doubtless equally good books. The books given are reliable, are prettily illustrated, are now in print, and are easily obtainable at any book-store. If they are not in stock the book-seller will be glad to send for them. Further, to aid in selecting and ordering, the retail price is added. A small circulating library of well chosen books adds greatly to the usefulness of a mother's club, and such a library can be collected at small cost.

Where the club is composed of heterogeneous members it is advisable that the president, or some member chosen for the purpose, should lead the discussion, which should be on some one topic selected and made known beforehand. This leader should not only guide the discussion, but be ready to explain the books and make the subject clear to those tired and overworked mothers who have had fewer educational advantages but who are in need of such knowledge as will enable them to guide their children.

A mother unconnected with a club, and unable to afford all the books she wants, can find many of those here recommended in the village or city library; and where this is not the case the library is generally willing to make such purchases as its patrons request.

## II

### WHO IS TO TELL THE STORY, AND WHEN IS IT TO BE TOLD?

EVERY thoughtful guardian of a child is sooner or later confronted with three questions in connection with this subject, —

Who is to tell the story to the child?
When should it be told?
How should it be told?

*Who shall tell the story?*

The best teachers in this subject are undoubtedly the child's parents.

Since the mother generally spends more time with him and is more accustomed to instruct him in manners and morals it naturally belongs to her to give him his first instruction here, and it is an opportunity which no mother understanding its value can afford to miss.

Nothing draws a child so close to his mother as the knowledge, rightly

conveyed, of how truly he is a part of her. Almost without exception the young boy learning the truth from the lips of his mother has a new feeling of reverence and love for her. Countless are the testimonies of mothers as to the result of telling this fact. One illustration will answer as an example of hundreds of similar ones. A certain little boy listened open-eyed to the story; then, the blood mounting to his cheeks, he threw himself into his mother's arms, exclaiming, "Oh, mamma, that is why I love you so!"

Moreover, if the right kind of confidence is established between mother and child, the child will come to his mother with his questions and difficulties instead of trying to satisfy his curiosity elsewhere.

The question is often asked, Will not close companionship and sympathy between mother and child in a general way produce the same result, causing the child to confide in the mother in case of needing information, without any previous talks on the subject?

Of course the closer the relationship between the two the more easily will the

child confide everything; yet with very many children, if this one subject is avoided (and particularly is this true as the child grows older), it will not be introduced by the child, no matter how much he may desire the knowledge, or how intimate in other ways may be his talks with his mother. The judicious mother can get a hold upon her son through this subject that nothing else gives; she can keep him closer to her, and oftentimes can guide him safely over difficult places. What is true of the son is of course true of the daughter. The little girl will respond as readily as her brother to confidences of this kind, and will find them as helpful. She very often escapes much that her brother in his freer life meets, yet undoubtedly in the great majority of cases the instruction is as vitally necessary to her as to him.

While the earliest teachings seem to fall most naturally to the mother, the father should also share the responsibility and the privilege, talking with frank confidence upon the subject whenever occasion offers.

The question is often asked, Is it not better for the father to talk to the boys, the mother to the girls?

There no doubt are cases where this might be wise, but the mother, understanding the close relationship between her son and herself that may come through such talks, — a relationship continuing and increasing in value as the years go on, — would feel that she could not afford to lose anything so precious to both her boy and herself.

While the establishment of this relationship might be difficult or even impossible later, it is easily begun in childhood and as easily continued. Moreover, many boys are specially helped by talking with their mother. They often feel in her a quicker sympathy and a more perfect understanding of their needs; and as their instinctive desire is to understand life from *her* point of view as well, they often feel something in her which is lacking in the father. On the other hand, the boy who is talked to exclusively by the mother, particularly when he begins to develop into manhood may say, or think, "Oh,

you cannot understand; you never were a man." The father's voice here is needed, but if that is impossible there is abundant written testimony and advice from well-known men to youth on this subject which can be put into the boy's hands.

While the child's best teachers of these intimate truths are undoubtedly his parents, it may happen for various reasons that this is impossible. The child may have grown to an age where the timid parent, who has not hitherto realized the necessity, cannot approach him. Or there may be other reasons. In such cases the duty may devolve upon some one else capable of fulfilling it. Such a one may be, should be, the minister. It ought to be a part of the recognized duty of every minister of a congregation to see that such of his young men as desire it are instructed in the facts necessary to their well-being in this direction. It is not enough to tell them to live pure lives; they must be helped to understand their own organizations and everything pertaining to this side of life that they need or want to know. There should be similar help

obtainable by the young women of the congregation from some competent woman approved by the minister. Purity is an integral part of the religion of the new civilization, and purity and everything helping to it should be as conscientiously and thoroughly taught in the churches as are any other religious truths. In the church the young man, the young woman, should be able to find corroboration of the sex-truths taught him by his parents; and those young people not so fortunate as to receive instruction at home should be able to drink from their religious teachers deep draughts from this spring of salvation.

The family physician ought also to be a refuge of help for the young; and here the woman doctor, that blessing of these later days, can do a work of reformation and salvation. No one has more power to sow seeds of wisdom in the homes of the people, helping the mother to understand and desire the careful instruction of her children, and where the mother requests it, being ready to give the needed help to the young people themselves.

Again, the teacher or some friend

may be requested by the parent to come to the help of the needy child. But whoever gives this information, it is needless to say, should himself be pure in heart, of high moral principles, with a firm belief in the value and possibility of purity, and with sufficient knowledge of the subject in all its aspects to be a wise instructor, giving not only physiological information where that is desirable, but working specially for ethical and spiritual elevation. Physiological facts alone may not have the slightest effect upon the manner of living; there should be first and deeply implanted a spiritual desire for purity, when the knowledge of such facts may be a valuable help.

The question is very often asked, Should this subject be taught in schools?

To a certain extent it is taught. Every botany class teaches its rudiments; and in the higher grades, where biology is taught, the pupil comes to a clear understanding of the main facts. School botany, however, merely glimpses at the truth, and biological classes are few and far between. So, as far as the majority of children are concerned, the schools

can hardly be said to touch the subject. Whether it would be well for the schools to deal with it is a very difficult question, so much depending upon the way the work is done. It might be possible to introduce it helpfully in connection with a well graded system of nature-study, but since such does not exist in most schools, and since there is very great danger in speaking in public on this subject before children, no matter how well the speaking may be done, it is undoubtedly better not to approach it directly in the schools, — at least in grades below the high school. Like religious training, this belongs peculiarly to the home and the parent. Although she cannot give general instruction, the teacher of children can help by being watchful of her flock, alert to detect signs of wrong doing, ready to help by private counsel, and — when parents consent — to give information to any needy child. In dealing with this subject the teacher needs to be as wise as the serpent and as harmless as the dove, not only for her own sake but for the sake of those she wishes to help.

*When to tell the story.*

It is an axiom of education that the foundations of knowledge should be laid in childhood. From all time it has been observed that what is learned in the earlier years remains most persistently through life. Hence we begin to inculcate moral truths at an early age. Ideas of truthfulness and honesty, for instance, are graven so deeply on the young mind that they can never afterwards be erased. "Just as the twig is bent the tree 's inclined," said our forefathers, and it is true. "First impressions are the most lasting," is another true adage. This being so, we should see to it that the first impression the child gets on the subject in question is the one we wish him to keep. Many a life has been lamed and saddened because of the first terrible and ineradicable impressions it received upon this all-important subject. Many a high-minded man and woman have gone through life tormented by images of the first unworthy thoughts. No matter how good the after-knowledge may be, it is almost impossible to erase from the tablets of memory that old first impression.

Of course it would be absurd to tell a young child most of the facts, just as it would be absurd to try to teach him the whole arithmetic in one school term. He could not understand, and, particularly in the case of the former subject, he would be harmed instead of helped. Just how and when to unfold the matter to his comprehension will be carefully considered as these pages progress. Here let it suffice to say that with the young child we may begin by building carefully block by block the foundation we want to use later; with the older one we must needs work faster, seeking to anticipate or counteract any unfortunate information from outside sources. Thus the age of the child and his surroundings will to an extent determine the time or times of telling the facts.

## III

### HOW TO TELL THE STORY

THIS is the most difficult question to answer, and one that requires time. Indeed, one might say it cannot be answered excepting in a general way, and that any effort to tell the truth sacredly is better than not to tell it at all. Where the children are still young the task is comparatively simple when once begun. It develops naturally, with time for thought on the part of the teller; and the steps are easy and convincing.

One of the questions most frequently asked is this: Does not talking about these things fix the child's mind unduly upon them?

As a matter of experience it is just the other way. The child who has always known the facts is not curious. Why should he be? There is nothing to be curious about. It is all as much a

matter of course to him as the rising of the sun. And he is safeguarded against a certain pruriency that comes from wrongly stimulated and vilely fed curiosity. Instead of causing the child to think more about the subject, the tendency of good teaching is to prevent his thinking of it.

Another question frequently asked is, Does not talking on this subject arouse curiosity in children who otherwise would not be curious?

The answer is that it does not arouse harmful curiosity. The right kind of curiosity on any subject is of course good. Indeed without the desire to question and investigate everything about him man would be yet a savage living in a hole in the ground, and the starting-point of all the child's after-knowledge is curiosity. There are two kinds of curiosity, a good kind and a bad kind. The good kind is interested in finding out things for the sake of understanding them; the bad kind serves a bad end,—in connection with this subject it leads to investigations which produce wrong thoughts and feelings, and is gratified

for the sake of producing those thoughts and feelings. The same subject may give rise to either kind of curiosity, according as it is presented.

To-day we take every pains to stimulate the curiosity of our children. We teach them to observe carefully the flowers, the insects, the animals, — everything about them. We cannot expect them to exercise their stimulated minds on all other subjects and turn blind eyes upon this one which is obviously so important and so interesting. No, the more they learn to look and ask about other things the more they will look and wish to ask about this.

That children differ in curiosity is very true. Some children seem to have very little curiosity about anything. Yet such children are sent to school with as much care as are the children eager to know. A child might show no interest in books, might find the reading lesson irksome; but the mother would know he was learning to read for the use that reading would be to him later, not for the sake of the things in the reading-book. It is the same here, the child

learns the facts for the sake of his future. There are good reasons which will appear later why every child should have the right information on this subject whether he seeks it or not. If he is indifferent, one can be sure the proper kind of information will not hurt him; if he is eager, one can be sure he ought to be carefully and thoroughly instructed.

As a rule the most active and eager children and those with the quickest minds are the ones most curious to understand the origin of life, though there are exceptions. It is not legitimately gratified curiosity that harms, but suppressed curiosity, which in this subject is almost sure to result in the acquisition of wrong and often of perverting information. The surest way to arouse curiosity is to try to conceal something. The only thing, then, is to be ready to gratify honest curiosity by helpful information.

Nor is it safe to defer too long. What the mother wants her child to know in a certain way she should tell him herself, before he has a chance to hear it elsewhere. The moment he leaves her presence, the moment he starts alone to

school, he may receive information which she would give the world to prevent his receiving. Not that her telling will necessarily keep him from hearing what others say, but to have his mind preoccupied will tend to prevent the wrong ideas from taking firm root.

Another question very often asked is, Will teaching this subject not encourage children to talk about it with other children?

On the contrary, the tendency is to prevent talk. The children of a family equally instructed will not find it worth talking about. They know what they want to know, and understand that the only person who can really tell them anything more is their mother, or whoever takes her place in this. If they do talk of it in the spirit in which they have been taught, such talk can do no harm, excepting in the presence of children not equally well instructed.

To meet this danger the mother can take certain precautions. Having won the confidence of her child, she can generally trust him to keep these matters

confidential with her. She can explain that children do not always know the truth about these things, and sometimes do not know about them at all. That some mothers do not tell their children, but that she wants her child to understand everything just as it is, and to feel that she can trust him not to talk on these matters excepting when alone with her.

Of course there will be instances where this does not succeed, and the children eager and pure will speak in the presence of the neighbors' children and make trouble. Then the question is, Which is better, to run that risk and take the consequences, or to run the risk of allowing the child to remain ignorant? If the child could really remain ignorant, there might be room for argument against enlightening him, but there is great danger that he will be enlightened in a very unenlightened manner, and possibly by those same neighbors' children who are truly ignorant, though they may not be ignorant in just the way their fond parents believe them to be.

Many people still confound ignorance

with innocence, though these are by no means related. The most ignorant person in the world might be the least innocent, and the most innocent might very well be the most enlightened. It not infrequently happens that the very children whose mothers are most opposed to enlightenment on this subject are dangerous companions for good children.

To guard against unprofitable or otherwise harmful teaching, the mother should instruct the child not to listen to talk on this subject and not to join in it, and at the same time tell him that in case he does hear anything that troubles him he should come to her and she will talk it over and explain, so that he may know what is right and what wrong. She should promise to tell him *the truth* about whatever he may want to know.

Having made this promise she must keep it. There is nothing more dangerous than to put a child off with evasive answers. He immediately jumps to the conclusion that there is some reason why his mother is afraid or ashamed to explain things to him, and if he has heard evil rumors it is quite natural for

him to suspect that what he has heard is the truth and the whole truth, else why should his mother not help him? He soon feels ashamed to ask her questions which she refuses to answer, and he ceases to confide in her. There is nothing easier than to win and keep the confidence of a child, and often there is nothing more difficult than to regain it when once it is lost, particularly in this direction. It is a loss the mother can by no means afford to sustain.

Mothers sometimes object that their young sons bring them the most shocking or absurd stories which they have heard in school or elsewhere. The mother who gives one moment's serious thought to such a situation will be forced to the conclusion that for her to hear such tales is nothing compared to the child's hearing them, and that his coming to his mother is proof of his own innocence. It is surely her first duty, no matter how difficult or unsavory the task, to sift out the wrong from the right, to show the child wherein the story is absurd, wicked, and harmful. At such a crisis the mother should be

very careful not to show any offence because the child has brought her the story. She may condemn the story as severely as she likes, but she must be careful that the child does not feel himself included in the condemnation. She must also be careful in denying the story not to deny the germ of truth which it will contain, or the child may conclude that she is talking against the facts, and is either ignorant or trying to conceal the truth. Many a mother has said in despair, "My boy of nine knows more about these things than I know myself."

It would be a great mistake to let the boy hear such a confession, as his very best safeguard is his confidence in the knowledge of his mother, or whoever assumes the duty of instructing him in these matters.

## IV

### TELLING THE TRUTH

SHOULD the mother tell pleasant but totally false stories as to the origin of the child, — or should she tell the truth?

It is generally safer to tell the truth. Excepting with very young children the fiction is not long believed, and a course of deception, having been entered upon, oftentimes proves a stumbling block in the way of later veracity. It is so much easier to go on telling fairy-tales. Moreover, the truth, properly conveyed, is far more beautiful than any fairy-tale.

The parent must not forget that the child's mind is a blank page upon which any picture may be drawn, and that the child sees only what is presented to him. The thousand problems, the thousand troubles and fears, and all the knowledge of evil that burden the mind of the adult are entirely absent from that of the child. He sees only the one shining

fact, that he was once a part of his dear mother, nourished and protected by her until he was ready to open his eyes on the big world. The child has very little interest in details as a rule; and how to meet the demand for them, should it arise, will be considered later.

If the mother tells the story of the stork bringing the newcomer to the home, or of the doctor carrying him in his pocket, or the apothecary selling him over the counter, the child very soon learns that this is not true. He gets an inkling of the truth, understands that he has been deceived, and according to his age, his nature, and what he has heard, he will draw his conclusions as to why his mother did not tell him the truth.

Mothers often ask whether there is any more reason for refraining from the stork fiction than from the Santa Claus one. When Santa Claus is found out, the whole thing is generally understood as a joke, a pleasant sort of fairy tale. There was nothing hidden behind the fiction. In the other case, if the child chances somewhere to hear the facts stated in a coarse manner, he will be

likely to feel instinctively that the new tale is the true one, and will naturally conclude that the pretty fable was told to conceal a most unsavory truth. His first impression of the real facts will in such a case be ugly and — in a deep sense — false. It will hurt his sensibilities, or arouse his lower nature, according to his temperament.

The mother can guide herself by a rule which has exceptions but which in the main holds good: The child able to ask a question is able to understand the answer.

This is by no means saying that all the facts should be stated at once. That would be absurd. The question asked should be answered as simply as possible, the parent remembering that children's questions are usually more profound to the hearer than to the asker. It is difficult for the adult not to read into the child's chance question all the profundity of his own years of experience, and the mother who approaches this subject with dread is almost invariably astonished and relieved to find how easily the child is satisfied.

Where the child asks by chance or

design (and it is a wise parent who can always decide which it is) a question beyond his comprehension, or one that the parent is not ready to answer, he can be put off temporarily with the promise to explain another time. The child may forget all about it. If not, then the promise must be kept; and the very fact that the child remembers shows that he is thinking, and therefore ought to be helped. If the child asks questions which the mother feels sure he is not ready to have answered, she can promise to tell him when he gets older, explaining that he could not understand now. In such cases, however, the mother should always manifest a willingness to tell him something; she should talk with him enough to make him feel sure she will keep her promise. He should never be allowed to forget that he can go to his mother as frankly as to his own heart, with the certainty of finding sympathy and aid. And she should not let him forget that he is not to seek information from outside sources, such information being unreliable.

## V

### ON NATURE STUDY

SINCE the most beautiful and ideal way of presenting the facts of the renewal of life is through nature-study, a few words as to the handling of this interesting topic may be helpful to some mothers.

In all nature-work with the child, the subjects treated should be made interesting and beautiful. This cannot be too strongly insisted upon. The child has a right to the pleasure, the elevation of sentiment, the play of imagination which the contemplation of nature is able to give in such a peculiar degree. He has a right to the romance of the flower, cloud, bird, fish, animal life, plant life, in all their ramifications. It is a part of his soul-development. Consequently, whatever is done for him should be done in such a way as not to hurt his sensibilities. His pleasure in nature should be

increased, not lessened, as a result of his study.

As his knowledge expands his interest should deepen. This will almost never be the case where the first instruction is purely technical. Nothing, for instance, has deadened the interest of children in plant life so much as the study of botany. This is because the school methods have been wrong, the work being almost always approached from the wrong end. It is because the learner's mind is dammed up by difficult and to him empty technical terms. As a consequence, the course of its flow in this direction is stopped, and instead of a clear stream leaping joyfully through the woods and meadows finally to reach the great goal of the boundless ocean, it resembles rather a motionless pond, the surface of which is covered with lifeless and unlovely debris. Naturally the child seeks to escape from this uninteresting and dead pool by turning his mental energies in other directions, and too often he loses interest forever, and with it the pleasure and the vast profit that might have come to him from a different conception of the subject.

Facts about the life of the plant should be abundantly presented, and the facts as collected and told to-day are well-nigh inexhaustible as well as fascinating. True stories of plant life can be, and should be, as interesting as any other stories. Technical terms should be used at first with great restraint, and, as a rule, only where they are obviously convenient or of such universal application that they are a distinct help in developing a sense of the continuity of living things. Those that are used should be so skilfully introduced, and their meaning so thoroughly digested, that they do not seem like technical terms.

Perhaps an illustration will make this point clearer. A child who loves flowers goes to school; he is given one of his favorites and told to pull it to pieces, look at its different parts, and label them with such words as petals, sepals, pistil, stamens; to these are presently added calyx, corolla, monopetalous, polypetalous, innate, adnate, indehiscent, etc., until the child's mind resembles a lumber room of senseless rubbish, in which the flower is buried and lost. To a sensitive child

this process is exceedingly painful. He often feels as though he were murdering some helpless thing he had loved, and conceals his tears and his heartache for fear of being laughed at. Less sensitive children are soon wearied and disgusted, and the love for nature which might have been aroused in them, to the sweetening and steadying of their whole after-life, receives a fatal check.

While the child's love for flowers, and his sentiment concerning them, should not be harmed by his plant work, on the other hand a certain tendency to weak sentimentality wherever encountered should be restrained. He should not be a mere receptacle for dry ashes nor yet a mush of sentimentality. The wise leader will discover the broad middle course where love of the flower shall be deepened, and, as it were, broadened, by knowledge of its wonderful structure and functions. These can be well understood without so much as one technical term, though the skilful introduction of a few helpful words will not detract at all from the pleasure of the study, and will be most convenient.

Even the botanical names of the flowers themselves are of questionable value. The main thing is to recognize the flower as we recognize any other friend, and of course some name is necessary, but that this name be technical is, in most cases, not even desirable. "Wind-flower" is quite as good as "anemone," better, indeed, as it expresses a certain feeling about the flower that "anemone" does not convey. So, too, "mayflower" is more suggestive than "trailing arbutus," and that than *Epigæa repens*. Thus at first let the children learn only the common names of the flowers, at the same time that they discover all that is interesting about them. Later, when their interest is sure, the pretty

THE ANEMONE OR WIND–FLOWER

name "anemone" will give an added charm. They can be told that it comes from the Greek word *anemos*, meaning wind, and that anemones grow in Greece, and all that part of the world, and are gathered by the little children there. If the children are of an age to be studying or reading the tales of mythology, or the fascinating beginnings of Greek and Roman history, they will be delighted to think that anemones were no doubt gathered by Ulysses and Hector and the other Trojan heroes when they were children in that far-away land, and that the grandson of Æneas saw them in the Campagna near the Rome he founded, as the Italian children see them to-day. Thus through his botany the child can get a more vivid sense of the life of the past, can have a link forged in that invaluable mental chain which links him, mind, body, and soul, to everything else in the universe, and the consciousness of which is one of our most precious and helpful endowments in this life.

The universality of life and mind and soul, the universality of the methods of their manifestations even, the unity of

life, — nothing by itself, everything going out into and permeating everything else, — this great truth, which ought to burst upon the young mind with controlling force at a critical period later, should have its way prepared in childhood.

So far as technical terms are concerned, the child will gladly take them — in small doses — when he understands the things they represent, — that is, when the knowledge comes before the label; and when he recognizes their convenience in grouping the different varieties and species so that their relations to themselves and to other plants can be kept in the mind with a minimum of exertion.

The time comes when the analysis of the flower can be as interesting as any part of the work, if it has been preceded by other information and if it is pursued intelligently and delightfully. To illustrate again. The wild rose looked at simply as a thing of beauty and perfume becomes yet more interesting to the child who watches the bee gather its golden pollen and its luscious nectar. There is a bond of union now between

the fragile flower and its winged guest that begets an altruism which later becomes normally the corner-stone of character. When the graceful tribute of the bee to the flower is presently understood, and the child learns that the seeds of the flower have to thank the bee for their life, the mind expands yet more, and glows at the thought of this relationship in which each of these charming creatures practically preserves the life of the other.

WILD ROSE WITH BEES GATHERING HONEY

Now, too, the thought that the seed, the child of the plant, is at the heart of every flower, that it is for this nascent life, this new venture into the great world, that the blossom unfolds in beauty and sheds its perfume on the summer air, yet more expands the joyous

interest taken in the blossom. The mind, through a knowledge of these facts, can leap out into wider spaces of feeling and imagination. Thus every truth the child learns about the rose in those first tender years ought to add to his poetic conception of it. Thus he should learn his rose until the time comes when its relation to certain other plants will be full of meaning and full of interest. Perhaps the child has studied the apple blossom, the strawberry flower, the peach blossom in this same delightful way. With a very little help he will recognize the similarity of all three to the rose. He will be delighted to know that these are as truly related as they seem to be, that they are indeed cousins in one charming family. How they came to be so different will be a natural question, the answer to which

THE SEED, THE CHILD OF THE PLANT, IS AT THE HEART OF EVERY FLOWER

will involve the latest and most valuable scientific discoveries. Indeed, in studying nature we should begin with the latest discoveries of science, which are biological and vital, and end with man's earlier efforts toward knowledge, — that is, with classification and nomenclature. When the child knows his plants he may be interested in their relationships and willing to do the necessary drudgery toward establishing them. If not, it does n't matter, he has the really vital part of the subject, the part that will best help him toward understanding all life, his own included.

It is to foster a high sentiment toward the life of the plant that the numerous so-called unscientific botanies which crowd the book-stores to-day are so valuable, and the numbers that are sold testify to the interest this side of the subject awakens. What technical botany has anything like the sale of these less technical books? So far as the real development of the world at large is concerned they are of inestimably more use than the technical works, though of course those were the stern Puritan parents who

have given rise to this flock of lovely non-puritanical children, and without which they of course could not have existed.

The technical botanies indeed have their use to-day, and it can be confidently expected that they will be more used than ever before, because of the large numbers who have had their interest quickened and a desire to know more awakened. Those who would have found botany interesting in spite of the old methods will pursue it yet more eagerly under the new. Many who would have turned away from it entirely will continue their study into the technical works, while great numbers who have no leaning toward technical study and would have had nothing to do with botany under the old methods, under the new will assimilate the best truths the study of this subject is able to give, and so far from finding a wild rose less fragrant or less beautiful because of their close scrutiny of it, they will find it infinitely more so, — infinitely more rich in affording poetical thoughts, comparisons, and images.

What is true of plant life is equally true of animal life. The first attention should be directed toward the animal itself, its life and habits, technical information coming afterwards.

## VI

### THE DEVELOPMENT OF THE SEED

IN dealing with the special subject of this book too much stress cannot be laid upon the value of associating the phenomena of the renewal of life with all other vital phenomena, instead of divorcing it from them.

Two reasons why the subject of reproduction has such undue prominence in the minds of many people are, first, the manner in which it has been made conspicuous through concealment; and second, the fact that when spoken of at all, it has been treated as a unique phenomenon unrelated to anything else. These are not the only reasons, but they are strong ones, and their existence is quite unnecessary.

Education, therefore, should remove both of these stumbling-blocks. The first one is easily removed, though the value of its removal depends entirely

upon the manner in which that removal is accomplished. The second is also easily removed, the only difficulty being how to do it in the most helpful manner. The problem, then, for the instructor to solve is, how fully to acquaint the child with the phenomena of the reproductive life without making the subject unduly prominent.

This can well be done by interesting him in all the phenomena of living things, and allowing the reproductive function to take its place, not as something alone and different from everything else, but as one in a series of vital phenomena, all equally important and all interesting; not as something peculiar to human life or to the higher animals, but belonging equally to every living thing, whether animal or plant, and manifesting itself in the same way everywhere. Nor is this as difficult as at first glance it may seem. Indeed it is not difficult at all if one can begin with the young child, building little by little the foundation upon which later to erect a noble superstructure.

It is a beautiful fact that the plant

world offers illustrations of all the underlying phenomena of the reproductive life, and that through the flowers the little one can get his first introduction to the great subject. Not that he will at first understand the connection between the flower life and the human life, but the facts in the flower having been clearly perceived, there is nothing easier or more beautiful than to expand the idea when the time comes, until it embraces all life.

But what about those children who are no longer in their infancy? How are they to be taught?

In practically the same way, with some modification of method.

Since the aim here is to present the subject from the beginning, the first succeeding chapters will deal with it as applied to the young child. Following this, methods for use with older children will be discussed.

Objects to be accomplished with the younger children in the study of the plant.

(1) To make them feel that the plants

are living things with activities like other living things.

(2) To convey a clear idea of the true relation of seed to plant. This can be amplified later to cover the reproductive phenomena of human life.

(3) To give them a foundation for understanding the relation of father to child, when the time comes to explain that.

Some children naturally think of the plant as alive; they endow it with thought, feeling, and emotion; talk to it, consult it, caress it. Others do not. In both cases it is of value to the child to know the deeper truths concerning the life of the plant. In the one case it will steady sentimentality and guard against later loss of interest, in the other it will stimulate imagination and foster a high type of sentiment.

An easy and effective way to begin the study of the plant is to watch it as it sprouts from the seed. Since a large seed, easy to see and simple in structure, is best, an ordinary bean answers the purpose admirably, particularly as the

bean has the convenient habit of rising up above the ground when it sprouts, the development of the embryo proceeding in full view. Any of the common varieties will answer the purpose, though of course the larger the bean the more easily it can be observed.

A child of three or four will be interested in watching a seed grow. The first season he may get only one idea, the seed grows into a plant. The next season the experiment may be repeated with as much of the story of the plant added as the little one can understand. Thus Spring after Spring the child plants his seeds and watches them grow, constantly adding to his store of knowledge about them, until the story of the plant and its seed is as familiar to him as any fairy-tale, and has gone into his consciousness to stay there forever. Let us examine the bean, then, and see what can be learned from it, the information thus obtained to be shared with the child as fast as his age and his power of understanding permit.

First let us examine the dry bean. It is hard, so hard that we can scarcely

bite it. Put it to soak in tepid water, leaving it over night. Next day look at the changes that have taken place in it. The first thing we notice is that it has swollen until it is twice as large as it was, being now soaked full of water. It is also softer than it was. Its outer skin during the process of soaking has loosened, being no longer firmly attached to the body of the bean. This skin, being unable to stretch, soon splits open by the swelling of the bean inside. We can easily slip it entirely off.

THE BEAN, SPROUTING, TO SHOW THE TWO SEED-LEAVES AND THE EMBRYO

THE BEAN — EMBRYO-LEAVES, SEED-LEAVES, AND ROOT

Having done this let us take a good look at the bean that is now out of its

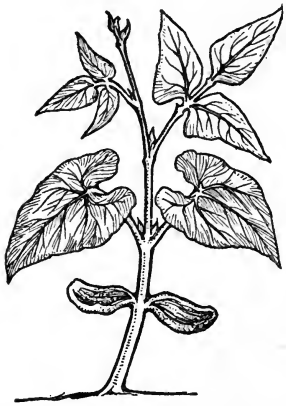
skin. We see that it is composed of two thick parts which are joined together at only one end. These two thick parts which make the bulk of the bean are called seed-leaves (cotyledons).

Just at the point where they seem to be joined together there is a tiny flat white object. Looking closely at this we discover it to be a plant consisting of two minute leaves and a little blunt tip. As a matter of fact, the two seed-leaves are not attached directly to each other, but each is attached to this tiny plant, or embryo, as it is called. The word "embryo" is a valuable one to use later, and its precise meaning can easily be fixed by always calling the young plant tucked away in the seed the embryo. The difficulty of learning new words does not lie in their length, but in not knowing what they mean. A child who has been to the circus has no trouble in remembering the word "elephant," and the child who frequently hears the word "embryo" spoken in connection with the plant concealed between the cotyledons quickly and unconsciously learns it.

Place some of the soaked beans on damp cotton, and plant others in a pot of earth, or, if it is Summer, in the garden. Those sprouted in the house in the Winter must be kept warm. In a short time the little white embryo tucked away in the bean begins to grow. We say the bean sprouts. As the embryo develops, its little blunt tip grows down into the ground and gives off roots. At the same time its two tiny white leaves grow large and green, coming out from the seed-leaves (cotyledons) into the air and sunshine. As the stem lengthens the seed-leaves are lifted up above the ground along with the embryo. The bean thus seems to come out of the ground, and children are very apt to want to cover it up. But it has not really unplanted itself. The lower part of the stem and the roots hold it firmly in the earth.

The bean on the damp cotton grows as well at first as that planted in the earth, but it cannot get food enough to continue growth unless it can thrust its roots into the earth. What enables it to grow at all on the cotton, since that does

not supply food, but only holds the moisture, without which the bean could not sprout? There must be food somewhere, and it is found packed away in the thick seed-leaves, which contain a great deal of starch and a little of some other things.



THE BEAN—EMBRYO-LEAVES, COMPOUND LEAVES, AND BEGINNING OF STEM

The young plant, under the influence of warmth and moisture, is able to draw out the nourishment from the seed-leaves. If we examine the seed-leaves after the seed has sprouted we shall find them less hard and firm; they have given part of their substance to the embryo. They have also turned greenish in color, while, as we know, the leaves of the embryo, which at first were so white and tiny, have also turned green and grown larger. Between the two embryo-leaves there is a little growing tip.

The young plant now no longer

depends upon the seed-leaves for its food. Down in the earth the roots are taking in nourishment, and up in the air the little green leaves are also busy supplying food to the growing plant. The little growing tip lengthens into a stem from which a leaf is seen unfolding. This new leaf is not shaped like the embryo-leaves nor like the seed-leaves. It has three leaflets. The stem continues to lengthen, and soon another compound leaf appears. Thus the stem lengthens and leaves keep coming, the little growing tip at the end of the stem always pushing upward.

Very soon the stem becomes too long and slender to stand upright. Then it does a strange thing. It circles about as though in search of something. It moves very slowly, but if you notice which way it is pointing in the morning, and again at noon, and again at night, you will see that it has changed its position. Why does it do this? It wishes to twine about a support, and will continue circling about until it finds one. If there is none, the slender stem, unable to stand upright as it lengthens,

will in time bend to one side or even lie on the ground; but the end still continues to circle about, and when at last it touches a stick or the stem of another plant or anything else about which it can twine, it continues its circling motion about the new support, and the vine as it lengthens finally becomes twined about it.

How does the food which the plant takes from the earth and the air find its way to the different parts of the plant to nourish them?

The plant food is in a liquid form called sap, which runs through channels in the roots and stems and leaves, and is thus carried to all parts of the plant. To a certain extent it is like the blood of animals, which finds its way all through the body and supplies food to the tissues.

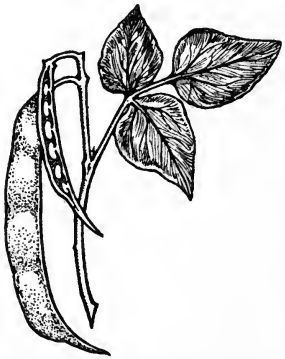
The plant is alive; it eats, it breathes; sometimes it even moves. It breathes the same air that we do, only it takes it in through tiny pores in the leaves. Eating and breathing, the plant continues to grow, leaf after leaf unfolding. At last, in the axil of one of the leaves

there comes a little bud that does not unfold into a leaf but into a flower.

The appearance of this first blossom on the plant the child has himself raised from the seed will be watched with eagerness, and its advent can be made a subject of general pleasure and notice in the home. The child's pleasure in his flower will be greatly increased if he finds that others are also watching and enjoying it.

Here, too, is a chance to develop a certain respect or reverence for the beautiful and fragile flower. It is not to be picked. We are to leave this flower and see what becomes of it. If we pick it, it will soon wither and die. If we leave it where it is, it will continue to grow, and something very interesting will happen. After a few days the pretty white or red flower-leaves or petals will fall off; but any disappointment which the child may feel at the falling of the petals can be quickly changed into interest about what remains, for not all the flower fell. The centre of it is still there. It is a little green pod. It is so delicate that by holding it against the

light one can easily see the little seedlets, or ovules, inside. "Ovule" is a good word to learn, and the easiest way is to use it at once, always referring to this little seedlet in the young flower-pod as the ovule. The word "ovule" means little egg; later, a word almost identical will be used for the eggs of animals.



THE BEAN — THE SEEDLETS, OR OVULES, IN THE YOUNG PODS

Thus by a use of carefully chosen, well-understood terms the child has from the very beginning a dawning sense of the oneness of all life. He can be told that "ovule" means little egg, and that the seed of the plant is the egg of the plant, which hatches — sprouts — into the plant we see.

It is better not to break the tender little pod to show the ovules, even if there are plenty of flowers. Look at the pod against the light and see the ovules dimly outlined. Each ovule is attached

to the pod by a little stem which can also be seen with the light shining through the pod. The stem the child can look for when the peas are being shelled for dinner, or when lima beans are being shelled. If the pea or bean pod is opened carefully, the whole row of seeds will be seen attached to the pod, each by its exceedingly short stem.

The ovary is a part of the plant in which grow the ovules. The perfect and clear understanding of just what the ovary is will be very helpful later, and the word "ovary" will be found extremely useful.

The interest should not be concentrated on the ovary to the exclusion of other flower parts. The bright petals should have their share of attention. They form a nest, or home, or covering, to enfold or wrap about the delicate seed-pod. The thought that they are fragrant and beautiful because of the young life they cherish, and that they never appear excepting where there are young seeds to be cared for, and that every flower has the little pod or seed-cradle at its centre, can be made to cast a lovely glow over

this side of the flower-life, which will later reflect more or less strongly upon all life.

When the child discovers that the ovules are attached to the ovary by little stems, this very important question can be answered, — How are the ovules nourished? They must have food, or they cannot develop into seeds.

The sap, which is the food of the plant, runs through the little stems that hold the ovules to the ovary, and thus, entering the ovules, nourishes them. The ovule has no embryo. It is a very simple little seedlet indeed. But after a while its little embryo begins to form and its seed-leaves to develop. When the ovule has developed in this way we call it a seed. It remains attached to the ovary, receiving nourishment from the sap until it is quite ripe. As the seed forms in its little pod, its thick sturdy seed-leaves become larger and fuller. The sap constantly stores up in them plenty of good food. Thus the parent plant provides for the seed, so that when it goes out into the world alone it may not perish until it has learned to care for

itself. The food in the seed-leaves is the bank account which starts the young plant in life.

When the seed is fully formed, its seed-leaves full of food, its embryo perfect, then we say it is ripe. It no longer needs to draw nourishment from the sap of the parent-plant. It is able to start in the world on its own account. When the seed ripens, its little stem withers away, so that the seed lies loose in the pod. In the case of the bean-pod, when the seed becomes free the pod opens, and the seed or bean, as we call it, falls out.

If we look at a ripe bean or pea or any seed we shall find upon one edge of it the scar where the little stem was attached. The scar is the umbilicus or "navel" of the seed. The seed does not become free from its attachment to the pod until it is able to live alone. As long as it continues to grow it remains attached and receives the sap. As soon as it has its growth and no longer needs the sap it separates from the pod. This separation is easy and natural. There is no tearing apart, no mutilation. It is exactly like the falling of the leaves in

the Autumn. It is, in short, the birth of the seed or infant plant.

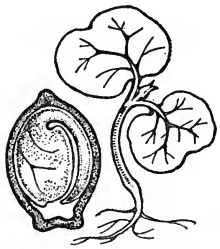
Some mothers talk of the mother-plant and the seed-babies from the beginning. They show how the little seeds are fed and protected, how they are literally a part of the mother-plant. Other mothers prefer to tell only the botanical story, leaving all application to animal life for later consideration. In either case the essential points are a clear understanding of the growth of the ovule in the ovary, the manner in which it is nourished and protected, and its final separation from the ovary to enter into the outer world as an individual provided with everything necessary to its needs.

Some mothers use the words "sprout" and "hatch" interchangeably, speaking sometimes of the hatching of the seeds, in order to make more vivid the realization of the similarity of processes in the plant and the bird. They also speak of the birth of the seed. Clearly to understand the relation of the seed to the mother-plant is to understand accurately and scientifically the relation of every living creature to its mother.

The child who enjoys planting the bean one season will want to plant it the next, for there is nothing children more delight in than planting things and watching them grow. This interest can be encouraged in any home, for where there is no available yard a few flower-pots of earth, or a box of it, will afford opportunity for a good deal of pleasure and instruction. The child can be encouraged to collect seeds that are formed like the bean, and plant them too. He will quickly discover that a peanut is made essentially like a bean, and he will be interested to plant some raw peanuts. The pea, too, he will soon add to his list. As the season advances he will discover the cucumber, melon, and squash seeds, and, with a little help, the apple, pear, and quince seeds, as well as those of the cherry, plum, and peach. The latter have very hard outer coats, but are formed in all essentials like the bean. Indeed he can have a very long list by the end of Summer. But he cannot make these green seeds grow. That is, many of them will not sprout until they have lain a certain length of time. So

even where they are ripe and fall from their pods, he had better keep them until toward Spring before planting, even in the house.

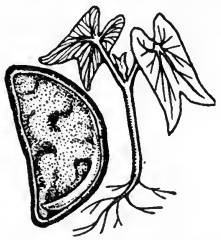
If he takes pleasure in examining his seeds, he will find in each one the tiny embryo tucked in between the seed-leaves; in the apple seed the young apple-tree, in the pumpkin seed the young pumpkin vine. Even the vegetables being prepared for his dinner can be interesting to him. As the peas are shelled he can see the pretty green seeds attached to the side of the pod. He can find the embryo even in the unripe seed, but he knows there would be no use in planting these green peas, for they are not yet fit to live apart from the mother-plant. If they were torn away and planted in the ground they would perish.



MORNING-GLORY SEED, SHOWING SEED-LEAVES AND EMBRYO

Not all seeds have the food for the embryo stored up in the seed-leaves. If a morning-glory seed be soaked, it will swell up and soften, and the hard outer

skin will burst. Inside will be found a tiny embryo with two thin, papery seed-leaves that contain no nourishment to speak of. But packed about the embryo is a rich food-substance which, though hard in the dry seed, becomes soft and gelatinous upon soaking, looking indeed not unlike the white of the egg, and having the same use; for it forms the first food of the embryo, which absorbs it. The embryo thus begins its growth, which continues until the roots and first leaves are sufficiently developed to supply nourishment.

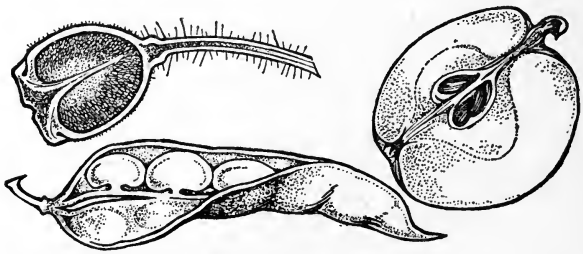


FOUR O'CLOCK SEED, SHOWING SEED-LEAVES AND EMBRYO

After the child has studied his beans, let him then study the morning-glory and four-o'clock seeds, which store the food separately from the embryo instead of in its seed-leaves. In every seed there is food enough stored up to give the embryo its first start in life.

During the Summer the child can be helped to pass many pleasant hours looking at seed-pods and finding as many

kinds as possible. He can discover how the ovaries are placed in the flower and wrapped about by the bright petals, being covered while yet in the bud by the green calyx. He can look at the different forms of ovaries and discover how some, like the bean, have only one compartment



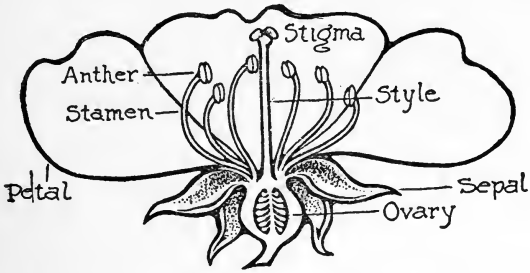
DIFFERENT KINDS OF OVARIES — BEAN, APPLE-CORE, POPPY POD

or cell, while others, like the apple-core, have five, and yet others, like the poppy pod, have many. If he is interested, he can quickly and unconsciously learn many of the more common botanical terms used in describing plants, so that when he comes to study technical botany he will find it shorn of most of its terrors.

Certain botanical terms are valuable both now and later; used simply, just as we talk of table, chair, bed-post, garden-walk,

etc., they are, as has been said, learned unconsciously.

In teaching the later facts of the reproductive life, it is a great help for the child to know the names and uses of certain parts of the flower; in many flowers, as for instance the lily, the parts




FLOWER — OVARY, STYLE, STIGMA, STAMENS, ANTHERS, PETALS, SEPALS

can be seen without pulling the flower to pieces. In the centre is the ovary, as the child already knows. Let him notice the long stalk on top of it and learn to call this the style. On top of the style is a knob — the stigma. Ovary, style, and stigma together make the pistil. Surrounding the pistil are six stamens, each having a slender stem or filament and terminating in a little box; this box is called the anther and is filled with

flower-dust or pollen. Around these is a circle of bright petals. In many flowers, outside the petals is a circle of green sepals, which in some plants fall off or turn down when the bud opens.

THE FLOWER

*Sepals* — usually green and affording protection to the bud.

*Petals* — usually large and bright.

*Stamens* — { filament (stem of anther)
anther (containing pollen)

*Pistil* — { ovary (seed-pod)
style (stem of stigma not always present)
stigma (knob at top of style or ovary)

The care of the mother for her offspring, that impulse of nature found everywhere in nature's children, is beautifully illustrated in the flowers. When first the petals fall, leaving the tiny green pod, it stands up on its stalk, but in a few days it will be found hanging down. Why should this be? For one thing, as the pod turns down it gets out of the way of the other buds that one by one are preparing to blossom, for beans generally grow in clusters, one blossoming after another. Thus all the flowers have plenty of room and air and sunshine, and

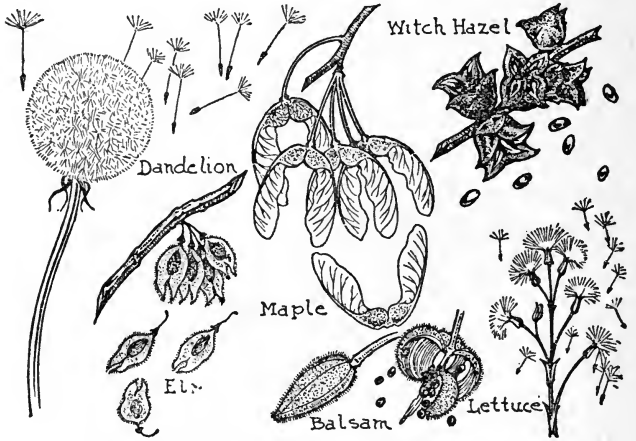
a lesson in unselfishness and thoughtfulness for others may be learned. Moreover, the hanging pod is better protected against accidents than the upright one. It is less noticeable and less likely to be knocked or broken off. The mother-plant takes every precaution possible for the welfare of the seed-children, even sending them far from home for their benefit.

THE DEVELOPMENT OF THE YOUNG BEAN-POD FROM THE FLOWER

Every one has noticed how the sweet-pea pods are curled up when the seeds are shed. This curling takes place just at the moment when the pod opens to allow the seeds to escape. This sudden twisting of the pod flings the seeds sometimes long distances. If the seed were to fall close to

THE SHEDDING OF YOUNG SWEET-PEAS FROM THE POD

the mother-plant it would find the soil impoverished in certain ways, the mother-plant having absorbed the food materials from it. If the seed can be hurled out of reach of the absorbing roots of the mother-plant, it may have




THE SHEDDING OF VARIOUS KINDS OF SEEDS

a better chance; even if it should fall where other things are growing, it may find the peculiar food it wants sufficiently abundant, for not all plants absorb just the same things from the soil.

Looking at the dried bean and pea-pods in the fall of the year, we shall find

nearly all of them twisted. And looking over the other plants of the fields and hedges, we see how much trouble has been taken to enable the seeds to go out in the world and find new growing-places. Some seeds are snapped out, as the touch-me-nots and witch-hazels; some are supplied with flat wing-like surfaces to be borne by the wind, as the maple-keys and elm seeds; some have bristles or down upon which to float in the air, as the lilies, dandelions, and lettuces; some have hooks by which to attach themselves to the coats of passing animals; and others have yet other devices for getting to pastures new. The whole subject of how seeds travel about the world is very interesting, and collecting these wanderers and watching their habits will afford a rich summer's entertainment.

Thus the child learns a thousand interesting things about the plant life, — among them, but not in any way prominent, the phenomena which are connected with the reproduction of the plant. This work can all be done before the child is eight years old, and

in many cases it can be done much earlier, at least so far as inculcating the most essential truths is concerned. Many details will slip away in time, but if the work is thoroughly done the great primal truths of living things will stay, and as the child's life unfolds, they will illuminate it in certain directions.

According to the age and opportunities of the child his information about the plant can be enlarged. The plant's method of breathing can be explained to one who knows something about the composition of the air, and of the use which the human body makes of the oxygen. The child who can understand it will be greatly interested to know that the plant uses the oxygen of the air, and returns carbon dioxide to it as a waste, essentially as his own body does. He should also know that the plant breathes very little in comparison to the animal, consequently it does not greatly affect the air, taking out but little oxygen and returning to it but little carbon dioxide.

The plant's method of taking nourishment from air and soil is also very interesting. It is only the green parts of

the plant that can take food from the air. The plant can become and remain green only under the influence of sunlight. So finally the plant owes its life to the power of the sun, just as in one way or another we all do. Plants in a dark place soon lose their green color, grow pale and sickly, and finally die. All green leaves and the young green twigs are able to take food from the air. The food they thus take is carbon dioxide, the very thing both plants and animals breathe out as a waste, and whose presence in large quantities makes air unfit to breathe. But the plant must have the carbon dioxide and can get it only from the air, so it is constantly withdrawing this harmful substance from the air and converting it into plant tissue. It consumes only part of the carbon dioxide, however, for the oxygen that is tied up in the carbon dioxide is set free and given back to the air, only the carbon being retained. So the plant is continually taking in the destructive carbon dioxide and giving out the wholesome oxygen, thus keeping the air pure and fit for us to breathe. In short, the

plant eats with its roots and with its leaves. With its roots it eats certain things it finds in the earth, and with its leaves and other green parts it eats the suffocating gas we breathe into the air.

This important function of the plant, in supplying the oxygen we need and in destroying the harmful carbon dioxide, can be illustrated in many graphic ways. We depend upon the plants for our very existence in this respect: they stand between us and destruction from excessive accumulations of carbon dioxide. On the other hand, the carbon dioxide is so important to the plant that it could not exist without it. All the carbon it gets is obtained from this source. Wood is largely carbon; a charred stick which retains its full size and shape is almost pure carbon. Thus the breath of our bodies is converted by the plant into the wood from which we construct our houses, furniture, etc. In a certain sense the chair we sit upon is made of the breath of our bodies. Besides these debts to the plant, we finally owe to it the food we consume, which comes from

the plant, even meat being but vegetable matter one step removed. The plant changes the chemicals which the animal cannot use in their crude form, into plant substances which animals can use. Thus the vegetable and animal kingdoms are mutually dependent upon each other. Neither could exist, at least in its present condition, without the other.

Not only will such facts as these be interesting to most children, they will deepen the dawning consciousness of the fundamental unity of all forms of life, which it should be the province of nature-study to develop.

It may not be out of place here to say a few words about the picking of flowers. Children instinctively want to pick them. They wish to possess, touch, caress these lovely objects. If left unguided, this tendency shortly degenerates in many children into a desire to pick every flower in sight. A walk taken by such children through the fields can be traced by the wild flowers that strew the way. Great handfuls are gathered, and then, becoming burdensome, are thrown down. The child who

lovingly watches his flowers grow and blossom will be less likely to destroy in this wanton manner. Here, too, is a good opportunity to teach him to be thoughtful and generous to others. If he carelessly tears up and throws away the flowers, those who come after him will not have them to enjoy; it is far better to look at the flowers and admire them in their own homes and leave them there. A little crowd of hepaticas at the root of a tree in the woods is one of the most charming sights of spring. Let the child who finds such a treasure call the rest, that they too may enjoy the pretty picture; let the children get down and put their faces against the flowers if they want to smell them, and then go away leaving the beauty undisturbed. Their adult comrade at such a time by exclaiming appreciatively over the sweetness of the little scene, the bright flowers against the dark tree, the green moss growing over the rock at one side, can often open young eyes to a harmony of beauty which will cause the whole composition to be recalled later with pure pleasure; a far deeper and higher pleasure

this little picture lingering in the memory than any number of flowers torn from their places soon to wilt in the hands of the vandals whose only thought is how to get the most in the shortest time.

Should children never gather flowers, then? Of course they should. But they should learn to exercise restraint, and as they grow older, judgment. They can easily be persuaded to gather only a few flowers. A few are almost always more beautiful than a great mass, and there is no exception to this whatever where the delicate spring flowers are concerned. Let the child carefully gather a few to take home to mother, father, sister, aunt, some dear one who has not shared the walk. These flowers should not be neglected, but at once put in water, placed where they can be seen and enjoyed, and the water should be changed every day as long as they last. In this way the flower gives real pleasure to a number of people, and the child learns several lessons valuable to the formation of his character.

As the child grows older, he can be

taught not only self-control against gathering useless quantities of flowers, but also to exercise judgment in regard to those he does pick. For instance, seeing a flaming bush against a superb background of green foliage, shall he disturb the poise of the picture for the sake of taking some of the flowers? Better is it to look about for similar flowers less beautifully placed. Instead of culling from the little hepatica company at the tree root, let him search for more hidden or less beautifully grouped flowers. The isolated flowers will be just as pretty after they are picked as are those in the fortunately placed groups; for he will soon learn that with the flower he cannot take its surroundings excepting in the memory. In this way he will be able to carry away a beautiful mind-picture such as would not remain if he had destroyed it; he will become more observant of the flowers as pictures, cultivate his taste, in short, and also learn to enjoy beauty without destroying it.

Wanton destruction of flowers should never be countenanced, no matter how

abundant the flowers may be. Self-restraint is not inculcated for the sake of saving the flowers so much as for the influence it will have upon the development of the child, although there are parts of the country where one would like to see it exercised for the sake of the flowers themselves. The child who learns to respect flowers will never be one of that discreditable company who by sheer vandalism are constantly driving the wild flowers farther into the back country, finally exterminating whole species. In many parts of New England, banks which were carpeted with arbutus a generation ago are now devoid of a single root. Spring may come and Spring may go, but no may-flowers will ever again shine from those banks to delight the eye of the woodland wanderer. All the generations to come must be deprived of the pleasure of these delightful flowers, the earliest visitants of spring—to what end? Did the pleasure they gave to those who took them compensate in the least degree for their loss to the world? Truly not.

In all the open places near cities,

where flowers would delight the greatest number of eyes and hearts, there are no flowers, and this because those who went first had no respect for the flowers themselves or for the rights of those who came after.

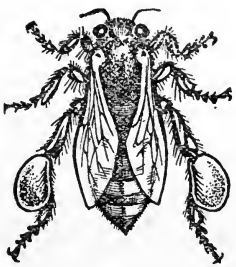
Not only should the child learn to exercise judgment in gathering flowers, but he should also learn how to gather them properly. If the arbutus had not been carelessly torn up by the roots and trampled on, it would have yielded its whole tribute of blossoms year after year without disappearing. If the arbutus-gatherers, knowing the nature of the treasure they were gathering, had gone armed with scissors and had clipped the blossoming ends without other injury to the plant, at the same time taking care not to trample it, the banks would still have been clad in beauty.

## VII

### THE FERTILIZATION OF THE FLOWER

AS a preparation for this work, let the children notice the flower-dust or pollen that shakes out of the flowers or is seen clinging to the anthers.

The child presently discovers where the pollen comes from. It is hidden in the anthers. He can hunt in all the flowers to find these little pollen-boxes, some of which, as in the golden-rods, are so small that he will have hard work to find them, even though they shed such clouds of pollen. He can notice the different kinds of stamens, see how some have long stems or filaments, others short ones, others again none at all. The filament is of no other use than



BEE — SHOWING POLLEN-BASKET

to hold up the anther. The anther with its pollen is the important thing; so there may be useful stamens with no filaments, but never useful stamens with no anthers.

The amount of pollen in the flowers is always astonishing and interesting. Why should there be so much?

That the bee gathers honey from the blossoms is one of the earliest things the child learns. Just whereabouts in the flower-cup, and just how the bee finds this honey, how it carries it home, where and how and why it stores it in the hive, is one of the most fascinating of stories, as good as a fairy tale. In connection with this comes very naturally the story of the bees and the pollen. The child will be delighted to learn that the bees collect pollen as well as honey; that the honey bees and bumble-bees have baskets on their legs on purpose to carry it home; that they knead it up with honey and make it into what is known as bee-bread.

We seldom see bee-bread these days, as patent hives furnish all the honey found in city stores and no bee-bread is

sold. In remote country places, however, where the honey is removed *en masse* from the hive, there will be plenty of bee-bread to give piquancy to the children's bread and honey. Moreover, where bees are kept, the bee-keeper can usually be persuaded to take out a little bee-bread for the children to see and taste; for it is always present no matter what the kind of hive used, though it is not always easily obtainable, for where their household arrangements permit, the bees generally prefer to store it in the lower chambers away from the honey. Thus the flower supplies large quantities of food for the bees and for us, and long ago, before America was discovered and before cane-sugar came into use, the people depended upon honey for their sweetening.

When the children have found how general is the presence of pollen in the flowers, where it comes from, and how it is gathered by the bees, they can learn that the pollen is valuable to the plant itself. It is indeed one of the most necessary parts of the flower, for without it the ovules could not develop.

The effect of the pollen upon the seeds can be prettily illustrated by a simple experiment. Take two or three little pots of geraniums whose buds are just ready to open. Be sure to have single geraniums, and to stand them where they will not be disturbed and where the wind will not blow upon them. Shortly after the flower opens, the anthers will be seen crowded in its throat and covered with pollen. After a few days the pollen will have dried up, and the style, tipped with a five-rayed star-like stigma, will push up above the anthers. Mark pot No. 1 as untouched. From pot No. 2 carefully take a little pollen on the end of a small clean paint-brush or tooth-pick and touch with it the five-rayed, star-like stigma of the flowers in pot No. 3. Be careful not to let any of it touch the stigmas of the flowers in pot No. 2, the pot from whose flowers the pollen is taken.

Leave the flower-pots undisturbed and watch results. When the flowers finally drop their petals, in pots No. 1 and No. 2 there will be no seed-pods remaining, everything will drop, including the little

flower-stalks and the main stalk supporting the whole cluster of flowers. In short, no trace of flowers will be left. So far as seed-forming is concerned, the flowers might as well never have blossomed. Very different will be the result in the flowers of pot No. 3. These received the pollen on the stigma, and in some way this pollen affected the ovules so that they began to develop. We say the flower was fertilized by the pollen, and "fertilized" is a valuable word to learn at once. When the petals of the fertilized flowers fall, all does not fall. There remains the ovary with the long style and the star-like stigma. The ovary continues to grow, as do the seeds within it. Since the geranium is a house-plant, raised under unnatural conditions, not all the fertilized flowers will succeed. Some may fall at once, like the unfertilized ones. But out of the whole bunch of fertilized flowers some will be almost sure to start the development enough to show that in some way the fertilized flowers were able to produce seeds, while the others will in no case make any attempt at

seed-forming. Even though none of the seeds come to perfection, the fact that they start at all will demonstrate the effect of the pollen. The geranium is a good plant to use in illustrating this point, because it is so constructed that it cannot fertilize its own flowers.

What the child thus far learns is simply that the pollen is in some way necessary to the development of the ovule. If the experiment with the geraniums is not practicable, the child can be told that the pollen is necessary to the development of the seed, that it falls upon the stigma and nourishes the little ovules down in the ovary, and that no seed can form without the aid of the pollen. All the seeds we plant in the flower gardens or in the vegetable gardens, and all the grain we sow in the fields, are produced by the help of pollen. All the peas and beans and other seeds we eat owe their existence in part to the pollen, and without it they could not develop.

Some parents teach their children at once that the pistil is the mother-part of the plant, caring for the young seeds, the stamens the father part, providing for

them, and that the stamens and pistil growing in the same flower are brothers and sisters. Other parents prefer to use only botanical terms, leaving the extension of the thought to later consideration or to the child's own logic, for children often reason out all the facts — in a very general way, of course — from only this botanical study.

But we are not yet done with the pollen. It not only assists the ovule to develop, but it impresses upon it its own characteristics. In other words, the seed inherits from the pollen as well as from the ovule. Inheritance is a very wonderful thing. It is that power which causes the offspring to resemble its parents. In some wonderful way the tiny ovule, the tiny pollen grain, remember everything about the plant they came from and are able to transmit this memory to the developing offspring, so that it may become like its parents.

Again, the child under eight can understand the principal facts of fertilization. The older child can add to his stock of facts, and one of the things he will be likely to want to know is how the little

pollen grain up on the stigma can influence the ovule down in the ovary.

We know how the ovule is formed. We know that it grows from the inside of the ovary. If we were able to examine the development of the pollen grain inside the anther from its very beginning, we should find the same thing true of it. The anther is a little box like the ovary, and the pollen grain grows from the inside of it, being at first a part of it and nourished by the same sap. When it became ripe it fell free into the anther cavity. We then have a little box full of ripe pollen grains.[1]

The pollen grain is like the ovule in structure, only much smaller. It is so tiny and the anther so small that we cannot watch its development as we can that of the ovule. But botanists have

[1] A great deal of confusion exists in many minds as to the origin of pollen and ovule. There seems to be a general and almost ineradicable impression that fertilization has something to do in creating the ovule. This is not so. The ovule is a part of every ovary just as the pollen is a part of every anther. Each will be produced whether they ever come together or not; only if they do not come together, both perish, while if they do, development of the ovule continues.

taken great pains to examine the pollen and to watch its development under the microscope, so that from them we know the truth.

If we examine the young ovule we find it apparently nothing but a little sac full of a semi-liquid substance. This semi-liquid substance, or at least a part of it, is alive and is very important. It is protoplasm, which is the only living substance; all the living parts of plants and animals are made from protoplasm.

Pollen Grains (Magnified), and Stigma

The pollen grain is also a little sac containing protoplasm. Thus we have these two little sacs of living substance, each growing in a similar manner, one to the inside of an ovary, the other to the inside of an anther. Naturally, it is the living substance in these little sacs that is important. It is the living substance of the ovule that unites with the living substance of the pollen grain to

become a seed; or, to say the same thing another way, it is the living substance of the pollen grain that unites with that of the ovule to become a seed; or yet again, it is the union of these two living substances that enables the seed to develop.

To understand how the pollen substance finds its way to the ovule substance let us examine the pollen grain a little more carefully. Pollen grains are of many shapes, though usually they are globe-shaped, or football-shaped. Tiny as they are, the outer skin is often marked with grooves and ridges in a very ornamental manner. They have two skins, an outer hard one, a softer inner one. The outer skin is not equally thick and hard all over. It has little glazed spots sometimes, like little glazed windows. Now, when the pistil is ripe the stigma is *sticky*. When the pollen grain falls upon this sticky stigma its inside wall swells up, just as the bean does when we soak it. But the outside wall cannot swell, consequently the inner wall finally breaks through at one of the weak spots in the outer wall.

Then the inner wall absorbing moisture and nutriment from the stigma actually grows, becoming a tube, which finds its way down through the style. The living substance of the pollen grain runs into the tip of this tube, and so is carried with it down through the style. The tube is nourished by the juices of the style as it goes along, and finally it gets to the ovary and the ovule. Every ovule has a tiny opening, or micropyle as it is called, and it is now easy to guess what that is for. The pollen tube pushes straight toward the micropyle, enters into the ovule through the micropyle, and then the living substance it has carried all this distance in its tip breaks through its delicate wall and mingles with the living substance of the ovule. When this has happened, the ovule begins to grow and to develop into a seed.

THE POLLEN TUBE PASSING THROUGH THE STYLE TO THE OVARY

We see that the whole pollen grain

could not possibly force its way down to the ovule. It cannot move of itself, for one thing, and if it could it is too large to pass between the tissues of the style. So it simply sends down the long tube, which grows fast, pushing along through the style, whose tissues are rather loose, and carrying with it the only valuable part of the pollen grain, its living protoplasm. No ovule can possibly grow into a grain without this tiny bit of pollen.

ENTRANCE OF POLLEN-TUBE THROUGH THE MICROPYLE TO THE OVULE

In explaining this union of the two protoplasms, the child's mind can be turned upon the wonderful mystery — one of the great mysteries of the universe — of how this tiny atom can influence the whole future plant. There is ample opportunity here to elevate his mind and spirit to a high plane, and, by talking of the wonders of inheritance, to give many a hint for future reflection. Without this law of inheritance the world would be chaos. Imagine the seed of a rose sometimes developing

into an oak tree, the egg of a bird into a bee or a trout. Imagine eggs developing haphazard into anything. There would be no use in living. Nothing could be depended upon. But there is no danger that any such thing will happen: the law of inheritance is unyielding. From a rose seed must come a rose bush, — and this is good. But on the other hand, from the seed of a weak, poor plant will grow another weak, poor plant. Whatever the parent is, good or bad, that must the offspring be. But sometimes the offspring inherits only the best in the parents, and so is better than they.

Thus in gathering his seeds, the child will select only the largest and best and take them from only the best plants to put in his garden the next year, at the same time planting beautiful truths in the garden of his soul. Not the least of these truths is a profound sense of the immutability of law. Through his nature-work the child can learn as nowhere else the stern, unbreakable decrees of law, and the respect and reverence due to it from every intelligent being.

Another important and far-reaching fact that the child can learn from his garden is, that his plants are good or poor according to the care he takes of them. They must have the right kind of food (soil), the right amount of water, the right temperature and surroundings, — some loving the open sunshine, others needing to be partly protected from it. In short, according as its environment is suited to its needs, and as its inheritance is good or bad, will the plant be strong and handsome or otherwise.

Another truth to be learned from the flowers is the value of cross-fertilization. This was demonstrated by the great Darwin, who fertilized a number of flowers with their own pollen, and an equal number with the pollen from the blossoms of another plant of the same kind. When the seeds were ripe he gathered them, carefully keeping those of the self-fertilized flowers separate from the others. The next season he planted both sets of seeds under exactly the same conditions, that is, they had the same soil and moisture, the same sun and air, and the same care. The plants

that grew from these two sets of seeds were very different, those from the self-fertilized seeds being smaller and weaker in every way than those from the seeds fertilized with pollen from another plant, or cross-fertilized, as we say, thus proving that it is not best for the plant to be self-fertilized. Someway, it needs the stimulus from less closely related pollen in order to grow vigorously and perfectly.

While the cross-fertilization of the same order of plants is so desirable, it is not possible for the pollen of one order to fertilize the ovules of another order. There must be a certain degree of similarity between flowers able to fertilize each other. The pollen of an apple blossom might, for instance, rest upon the stigma of a lily, but the pollen could not penetrate to the lily ovule. It would have no effect upon the lily.

That the seed inherits equally from the ovule and the pollen grain is a truth that should be impressed in many ways. It is very wonderful that anything so small as a pollen grain, often as small as the tiniest speck of dust, should be able to transmit to the young seed the

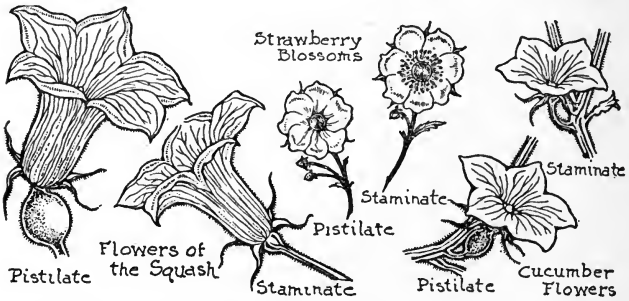
peculiarities of the plant from which it came. That it does this, the child himself can prove in a most interesting way. He can plant some white petunia seeds in one side of his garden, and some red ones in the other. The seeds should come from a reliable florist's in order to be sure of results. When the petunias ripen their seeds, those from the white flowers should be gathered and carefully labelled, and then those of the red flowers, care being taken not to mix the two colors. The next summer, plant the seeds as before. When the flowers blossom, those in the white bed will no longer be white, — some may be, but others will be red, and still others red and white. The same will be true of the flowers in the red bed. What has happened? The bees going from flower to flower have carried the pollen from one bed to the other, and some of it, rubbing off on the stigmas as the bees searched for honey, fertilized the flowers. Thus some of the ovules of the white flowers received an impression of red from the pollen of the red flowers, and grew into red flowering plants. In

others where the impression of red was less strong, the result was the production of red-and-white spotted flowers.

By fertilizing white flowers with pollen from red ones we can almost always get seeds that will develop into plants bearing flowers that are not white. What is true of color is true of other characteristics of the plant, such, for instance, as size and shape of leaves, habit of growth, size, shape, and quality of fruit, etc. Thus by careful cross-fertilization, we are able to produce not only beautiful and new blossoms, but also many delicious new fruits. Most of our cultivated fruits have been produced in this way. For instance, if two species of wild strawberries were found, one, large and beautiful but sour or tasteless, the other, small but delicious, the two could be bred together until finally a perfect berry, large and well-flavored, would result.

When the children are interested in their gardens they can try to make a new flower, using for the first experiments one that comes up from the seed, blossoms, and matures its seeds the

same year, and also readily changes its color as a result of cross-fertilization. Such are the petunia and the sweet-pea. The prettiest new flower produced can be marked and its seeds saved for future use, and the flower can have a name




FLOWERS NEEDING CROSS-FERTILIZATION, SOME WITH OVARY BUT NO STAMENS, OTHERS WITH STAMENS BUT NO OVARY

of its own. Florists often name their choice new flowers from some beautiful woman, and it would be a pretty tribute on the part of the child to name his favorite new petunia or sweet-pea after his mother. Of course this work will necessarily be very crude and the results uncertain, since the successful production of new plants is a science in itself; but enough can be done to interest the young experimenter thoroughly and

enable him to learn many valuable lessons. In these early, childish experiments, an interest in gardening may be awakened, which will last through life, the man, the woman, finding rest, relaxation, exercise, and pleasure in going from the trying daily work to the garden a while every day. Even a plot of ground a few feet square can afford great opportunity for experiment and beauty.

Cross-fertilization among the plants does not, of course, depend upon man as an agent. Since cross-fertilization is so valuable, it is not surprising to find many devices in the plant world for securing it. Honey and color, which attract winged messengers, are among the most universal helps to cross-fertilization. In many cases, the structure of the flower is such that it cannot fertilize itself. In the geranium, the stamen and the pistil in the same flower mature at different times. In some species, as among the lilies, the style is so long that the pollen could not fall upon it without artificial aid. Some flowers are so constructed that they can be fertilized by certain kinds of insects

and by no others; among these are the orchids and our clovers and milk-weeds. Again, some flowers have an ovary but no stamens, while a neighbor has stamens but no ovary, making self-fertilization absolutely impossible.

Indeed there is nothing more fascinating in the study of botany than the methods by which the flowers secure cross-fertilization, nearly all of our common garden-flowers affording illustrations. Here too, is a field where the young botanist can do really valuable work, for while much is known and has been written on the subject, much remains unknown. There are many books that give valuable and delightful information about cross-fertilization.

The method of fertilization of the flowers satisfactorily accounts for the great amount of pollen produced. Being blown by the wind or carried by insects, much of it is wasted, consequently there must be ample allowance made for this waste. So the flowers produce thousands of pollen grains which they can never use themselves.

# VIII

## WHAT CAN BE LEARNED FROM THE LIFE OF THE FISH

WHATEVER is universal is good.

Whatever is universal is true.

Whatever is universal is beautiful.

Nothing disperses, so to speak, the fogs enveloping the thought of sex like the realization of its universality. The air clears when we know that every living thing is bound by the same laws, even the flowers in our gardens.

We have an interesting testimony as to the helpfulness of this thought from one of the great educators of youth, Fröbel. Speaking of his own childhood when he became conscious of what his father, who was a minister, was constantly meeting in his parish work, he says:

"Matrimonial and family relations were often the subject of his admonitory and corrective conversation and remonstrances. The

way in which my father spoke of this, made me consider the subject as one of the most pressing and difficult for man, and in my youth and innocence, I felt deep grief and pain that man alone among created things should pay the penalty of such a sexual difference that made it hard for him to do right. . . . Just then my oldest brother, who lived away from home, came back for a time, and when I told him my delight in the purple threads of the hazel buds, he made me notice a similar sexual difference among flowers.

"Now my mind was satisfied. I learned that what had troubled me was a widespread arrangement throughout nature to which even the quiet, beautiful growths of flowers were subject. Henceforth human and natural life, soul and flower existence, were inseparable in my eyes, and my hazel blossoms I see still, like angels that opened to me the great temple of nature. . . . Henceforth it seemed as if I had the clue of Ariadne, which would lead me through all the wrong and devious ways of life; and a life of more than thirty years with nature, often, it is true, falling back and clouded for great intervals, has taught me to know this, especially the plant and tree world, as a mirror—I might say, an emblem—of man's life in its highest spiritual relations; so that I look upon it as one of the greatest and deepest conceptions of human life and spirit when in holy Scripture the comparison of good and evil is

drawn from a tree. Nature, as a whole,— even the realms of crystals and stones,— teaches us to discriminate good from evil; but, for me, not so powerfully, quietly, clearly, and openly as the plant and flower kingdom."

The stronger this feeling of the universality of sex, the more dispersive, as it were, is the thought of the subject. It would be difficult to connect personal and impure thoughts or feelings with a star whose distance in space was realized; and so with all other thoughts, the more they can be elevated into wide, general regions, the less disturbing they will be likely to become.

All the facts of sex-life can be learned in the flower, and the associations thus indelibly impressed cannot fail to leave at least a trace of fragrance and loveliness on even an obtuse nature. No matter what the later experiences or mistakes may be, the whole conception of this side of life cannot sink so low as might be the case if there were not this flower-sweet background. And that is worth something.

It is not difficult to pass at once from the flower life to human life, and there

are cases where this may be advisable. When, however, the beginning-work has been done with young children, and when we consider all the stress laid upon nature-work these days in school and out, and all the books written and all the stories told of living creatures of all kinds, it is helpful and easy to linger in the delightful and impersonal realm of the lower life yet longer, with this distinct advantage, that the *feeling* of universality, which is very different from the *thought* of it, will be strengthened.

For several reasons, the step from plant life to animal life can well be taken by means of the fish, particularly with little children. There is nothing prettier than living fishes in water. The fascination they have for all conditions and ages is shown by the crowds always seen at exhibitions of live fish in aquaria.

The child can have his little aquarium at home, which may consist of a glass globe plentifully supplied with some pretty water weed and a goldfish or two. Fishes do not like the bright light all around them, and should be

provided with some sort of refuge, like the water weed, or if the tank is large enough, with stones piled up to make a cave. For the same reason, the globe should not be set in the window or on the middle of a small table, but should be placed where at least one side of it may be shadowed by something. Pebbles should be put in the bottom of the tank and not too many fishes crowded together. They need room to move freely, and also plenty of fresh water for breathing. At the bird-stores small aquaria can usually be bought and fitted out with the proper amount of water plants to balance the breathing of the fishes. For the impurity breathed out by the fish is the same as that breathed out by all creatures, the carbon dioxide which it discharges into the water being just what the water plant needs to grow on. Also the water plant returns pure oxygen to the water, which is just what the fish needs to breathe. This story of the interdependence of the two, and the possibility of so balancing the plant and animal life in the tank that it is never

necessary to change the water, can be made very interesting and, needless to say, very illuminating. The fish cannot live out of the water, and yet it breathes air. There is always air in the water unless it has been artificially removed as by boiling, and this little bit of air is enough for the fish, which is cold-blooded and does not need so much fuel to keep its vital forces burning. But this little it must have, and it will suffer for the want of it, just as we suffer in a very close, unventilated room; and if the supply should become too small, the fish will die, just as we should die in a room where no fresh air could enter. So the fish must have the water changed unless there is enough plant life in its tank to keep the air pure. When suffering for air, the fish shows signs of distress, which should never be ignored. If it keeps close to the surface of the water with its mouth up and frequently swallows the outside air, that is a sign it needs fresh water. If it does not have it after a while it will die, as it cannot live on air undiluted by water.

Fishes need very little feeding, particularly if there are water plants in the tank; they find food from them. The best way is to follow the directions of the man who sells you the fishes. If too much food is given them it quickly fouls the aquarium, and then the water must be changed and everything cleaned up. In changing the water, care should be taken to have that which is put in about the same temperature as that taken out. A sudden application of too cold water is not good for the fishes. The children should take care of their pets themselves and see that they do not suffer.

The motions of the fish are what make it so attractive. How does it swim? Not with its fins to any extent. The whole back part of the body, including the tail, is moved from side to side as the fish swims. It moves its tail as a paddle is used at the stern of a boat, and so the fish paddles himself along. The fins are used more as balancers. They keep the fish upright in the water. As soon as it stops using them, it turns over on one side.

The fish opens and shuts its mouth constantly; it appears to be swallowing water. And so it is, so far as its mouth is concerned, but the water it takes in does not go down into the stomach. It is not really swallowed, but passes out at the gills, which are also constantly opening and shutting. The gills are red inside and are covered with a fine network of blood vessels. The air in the water moves against these delicate blood vessels, which are able to take what they need — the oxygen — from it. Thus the fish uses gills instead of lungs for breathing.

Sometimes fishes pick up pebbles in their mouths and drop them again. Some fishes, but not goldfishes, make noises.

The adaptation of the fish to its surroundings is interesting. Not only is its form the very best for moving quickly through the water, but its covering is peculiarly appropriate, many fishes having a hard, protecting coat of shining scales. These scales, besides being beautiful and useful, are interesting in another way, for we know

that they are only modified hairs, growing from the skin as hairs grow but having their form and size developed in special ways to serve their purpose. Scales and feathers are only another form of hairs.

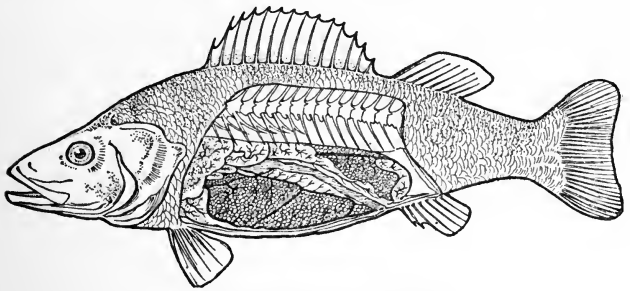
Many interesting stories of fishes can be told or read to the children, and among other things they can learn about the swim-bladder, the large, strong air-sac, which can be compressed or distended at pleasure, making the fish lighter or heavier and enabling it to rise to the surface of the water or sink to the bottom. In Nova Scotia, where many codfishes are caught, the swim-bladders are called sounds, and are cooked as a delicacy.

In the spring of the year we eat the roe of fish, which is nothing more nor less than fish eggs. Wherever shad are used, the children will be familiar with the shad roe; and in the South mullet roes are universally used. The people there dry them in the sun, and the children particularly are very fond of them. The Russian caviare is the eggs of a species of fish, and is considered a great delicacy by some people.

Where do these eggs come from? The fish market or the kitchen on fish day will answer the question. The child who is privileged to pass part of the summer at the seashore where fishermen ply their trade will have ample opportunity to know, as will the child who goes fishing in any brook or pond and is allowed (as he always should be) to clean and cook the fish he has caught. Also the smelts, which are cooked whole, only the intestines being removed through a hole near the gills, will answer the question.

The eggs of the fish are contained in a sort of double pouch or sac, shaped something like an old-fashioned silk purse. These sacs open into the intestine near its exit. They are the ovaries of the fish. From the inside of each ovary the tiny eggs, or ova, grow, just as the ovules grow in the plant ovary or seed-pod. At first they are a part of the ovary; later they grow larger and fall loose, until the ovary is filled with them. The ovary is always inside the fish. It is there when the fish is born, and even then there are the tiniest

hints of ova in it. But the ova do not grow large until the fish is mature; they wait until the fish has developed its strength, its bone, and muscle. Then in the springtime they grow rapidly. They grow until they are ripe, when they lie free in the ovary; and others grow and



The Ovary of a Fish

are freed in the same way until the ovary, which has also enlarged to accommodate them, is quite full. The female fish is larger than the male, and looks plump and rounded at this season. In course of time the eggs thus developed will be shed — or born — whether they are fertilized or not. But, if they are not fertilized, no further growth will take place in them, and they will soon perish.

The child, knowing about the fertilization of flowers, can easily be led to see that the fish ova, like the flower ovules, cannot develop without pollen. The anthers containing the pollen are found in the male fish, and look like the ovaries, only they are not so large and their contents are not so firm. They seem filled with a formless substance instead of with little globular eggs. Under the microscope this formless substance is seen to be made of a semi-fluid material in which are held millions of pollen grains! Only we no longer call them pollen grains. We may call them fertilizing cells if we please, though there are several names for them. But they are essentially the same as pollen. They grow, in the same way, from the inside of the anther (which may now be called the testicle) and become free when ripe. The pollen grains cannot move of themselves; the fertilizing cells can. Each fertilizing cell is like an ovum, excepting that it is not so spherical and is lengthened into a sort of lash by which it can propel itself through the water. When the ova are laid by one

fish, the other swims over them and the fertilizing fluid is expelled into the water just as the eggs were. There is no union whatever between the parents for the purpose of fertilization. As soon as a fertilizing cell comes in contact with an ovum it seeks to enter into its substance, and as soon as this has happened, the two cells thus united begin to develop into a very tiny fish. As soon as the change begins, we have the *embryo* of the fish, which thus corresponds to the embryo of the seed.

There is one great difference between the ovary of the plant and that of the fish. When the plant ovary is ripe, its seeds are shed, and then the ovary itself falls off. The plant ovary thus bears only one set of seeds. In the fish, the ovary always remains in the fish, and after the eggs are shed, it shrinks up to a very small size, and remains so until it again develops and becomes distended with more eggs the following season. The same is true of the fish's testicles. When the time comes, the fertilizing material is expelled. After this the sac shrinks up to small size until the following season.

When the embryo has grown to its perfect form, the egg-shell is broken and out swims the young fish. When it leaves the shell we say it hatches, just as we say the plant embryo sprouts when it leaves the egg-shell or seed-shell. Like the pollen of the flower, the fertilizing cells of the fish cannot act upon any ova but those of its own species.

The young fish, like the young plant, inherits characteristics from both parents. From its father it may acquire a certain shape, certain markings, a certain disposition. Since the father's part in the creation of his offspring is less obvious and apparently less intimate than that of the mother, the child can be helped to put a certain value on the thought of fatherhood which later will strengthen the bond of union between himself and his own father, deepening his love for his father and his confidence in him. That the boy love his father is as necessary to his welfare as that he love his mother, and the mother should, in all the early years in which the sex instruction may fall most heavily on her, impress upon the young

heart the beauty and glory of paternity. The sacrifice of the father who gives all his strength and time, scarce allowing himself a moment of relaxation or absence from business that he may provide for the needs of the family, is as great as the sacrifice of the mother who devotes her time and strength to caring for the home and the children. The tendency in teaching young people is to lay all the stress on motherhood and mother love, which is a manifest injustice to the human father, who deserves not only the natural love of his children, but the deeper, more consecrated love which comes from a pure and perfect knowledge of fatherhood.

Perhaps nothing will help a young man at the most critical age of his life so much as his love and faith in his father. And perhaps nothing will tend to lift the whole subject of paternity in the popular mind to the plane where it belongs, as will this love and knowledge, when it is bred in the child from his early years. Many difficulties in handling this subject that become insuperable might never even exist if the

knowledge of fatherhood, if love and respect for it and for the father as the giver of life, were bred into the boy at an early age. Moreover a certain shyness, which often makes it more difficult for fathers to talk to their sons on these matters than for the mothers to do so, would not have existed if they themselves as children and youth had been educated to a complete knowledge of the sex-life by one or both parents. The cause of this shyness is in many cases ignorance of how to present the facts, and a misconception of the difficulties of speaking to a pure-minded child about them. Nothing surprises the parent more than the way difficulties vanish when once the course of instruction to the youth has been entered upon.

In the lower life the father seldom cares for his offspring; and this is true among the fishes, where neither parent as a rule assumes any other responsibility than properly disposing of and fertilizing the eggs. Where, however, any care is taken, it not infrequently devolves upon the father instead of the mother. This is true of the fresh-water

black bass and of the stickleback, where the father protects the eggs until they are hatched, and protects and cares for the young fish. In the case of the stickleback, the father even makes a nest to contain the eggs.

Thus far, the process of the renewal of life is, so to speak, impersonal. The eggs are laid by one fish and fertilized by the other, this being necessary to the development of the young. The parents are endowed with an instinct which informs them when the time is at hand; and the male fish guided by this instinct applies the fertilizing material where it is needed, — that is, over the surface of the fresh-laid eggs. The number of eggs laid by fishes should be noticed, as it is a fact which will be useful later. Several millions of eggs have been counted in the ovaries of one fish. The number of fertilizing cells in one testicle would be incalculable. Fish eggs and young fishes are liable to many fatalities; they are destroyed in immense numbers. Consequently, if the race is to survive, there must be an almost inexhaustible supply.

Fishes kept in confinement will not as a rule multiply. Nothing is so sensitive as the reproductive system. Lacking certain stimuli which it finds in its natural surroundings, it will not become active. The goldfish in the globe will, if a female, have the ovary containing undeveloped ova, the male will have the testicles containing the fertilizing cells, but these will not mature. It is as though the whole system of the fish missed the freedom of space, the changes of season, the variety of substances at the bottom of the water, — all that goes to make "home" for it, and so languished in body as well as spirits.

The child who, in connection with a multitude of other interesting facts concerning fish life, learns those concerning its multiplication, will look upon them as perfectly natural and matter-of-fact.

But, some one objects, will not the child at this point guess the whole truth? Suppose he does? Is not that just what we want him to do? Is it not a sign that he has a good reasoning mind? He may arrive at the right general conclusion, but he has a conception

that is very general, vague, not at all personal, and entirely lacking in any material for malodorous thoughts and feelings. By constantly turning his thoughts to the wonders and truths of heredity and to the marvel of the development of living things from such insignificant yet momentous beginnings, and by telling him interesting facts of animals and plants along these lines, his thought can be kept general and on a high plane. Where details are demanded, the parent ought to be thankful that these are presented to him for elucidation instead of to some incapable outsider, and he can meet the demand according to circumstances, — all of which will be discussed more fully presently.

If the parent keeps ever in mind the fact that the child *must know* some time, and ought to gain a high conception of the subject before being exposed to degrading influences, if he asks himself in all honesty, "Unless I answer this, who will? and how?" he will be helped to do what in his own heart he knows to be his duty.

Moreover, there is a great gain to many a child in learning the main facts at an age where they do not appeal powerfully to his imagination nor move his senses. Later, when any reference to the subject may have this effect, and when there is enough to understand and meet without going back to the rudiments, it will be much less difficult to give the needed aid with this background, which causes the child to feel that he has "always known." To have always known a thing robs it of any great special interest. We pay no attention to the sun that shines upon us, but if this were a phenomenon of very rare occurrence we should be thrilled by it and aroused to curiosity and special observation and interest.

The child's knowledge of the sexuality of nature should be as much a matter of fact as any other knowledge, and the mystery of it should be presented to him as a sublime and beautiful mystery, creating an impression he cannot wholly escape from when he finds himself caught in the vortex of his own adulthood.

# IX

## AMPHIBIOUS LIFE

TO the parents who desire to lead the child's mind through a long sequence of thought from the lower to the higher life, the amphibian affords an easy step in this ascending scale. And among amphibians that familiar and picturesque harbinger of spring, the frog, and his cousin the friendly toad, are the best adapted.

Children are always interested in frogs because they jump so well. This suggests a starting-point for making their closer acquaintance. Why do they jump so well? It is because of their long hind legs. A little watching of either frog or toad will show exactly how the legs are used and wherein they differ from, and also resemble, the child's own legs. The little hands of the frog and toad, their way of sitting, leaning

on their short arms, their eagerness to snap up a tempting fly, the queer tongue fastened the other way round from ours, and its lightning-like speed which is a result of this same position in the mouth, — a hundred interesting things can be learned about the toads and frogs.

Toads are very easily tamed, and make most amusing as well as useful pets if there is a garden to be protected from marauding insects. They generally have a hole or corner to which they come home regularly at night, and with a little patience can be so tamed that they will take food, of living insect or even of scraps of meat, from the child's hand. Their power to gormandize seems unlimited, and the number of insects they can swallow without protest is almost incredible. They will keep a small garden quite free from slugs and other pests. They have no bad habits, do not bark at night, or chase cats, or bite, or steal, or insist upon coming into the house, or scratch up the flower-beds. Some accuse them of causing warts, but this is not true.

When handled, they sometimes give forth an acrid liquid from the skin, which stings the mouths of tormenting dogs and smears meddling fingers. But this, though unpleasant, does no harm. Many people have handled toads freely and never had a wart; many others who have never touched a toad have had many warts.

The toad may be ugly to look at, but that is not his fault. To many, he is more comical than ugly, and no creature has more beautiful eyes than this same homely toad. He is one of the most useful of animals, and should never be killed or ill treated.

The frog is less familiar to us than the toad, living as he does in the water or in wet places. Boys often take delight in killing him, having theories of the terrible influence he exercises in the affairs of man. He is as harmless as the toad and of value in keeping down insect pests, since these are also his food.

In the spring of the year, the frogs and toads will be heard chirping, the frog in particular sometimes filling the

night with his din. The earliest of these voices comes from the smaller green frogs, or "peepers," as they are often called because of the peeping noise they make. The deep bass croak comes from the large bull-frog, so named from his size and not from his sex, for there are female bull-frogs. When the frogs begin to peep, the children will enjoy making an excursion in quest of frogs' eggs. These will be found in any pond where the voice of the frog is heard, and can be taken with a long-handled dipper or by wading,—the latter practice to be cautiously indulged in northern latitudes at this time of year, as the water may yet be very cold.

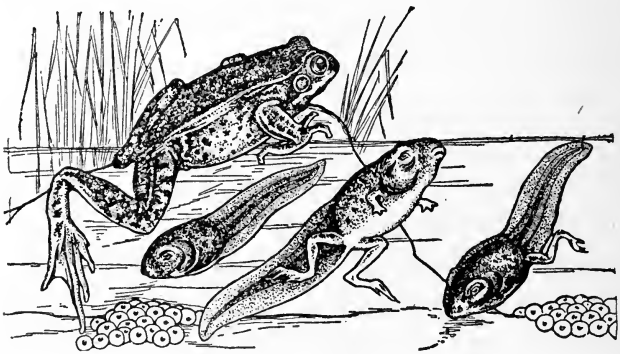
The eggs are gray, spherical, about as large as sweet-pea seeds, and have a black spot on one side. They are found embedded many together in a colorless jelly-like substance. The egg-mass should be handled carefully and put whole into a jar or pail of water and thus carried home. It should not stand with the sun shining directly on it, and when the water is changed, every other day, that which is used should be of

about the same temperature as that removed. Water drawn cold from the pipes will sometimes kill the eggs.

If all goes well, in a few days the eggs will hatch. Out of them will hatch, not frogs, but tadpoles, or polly-wogs, as they are also called. Every-one likes to watch a tadpole — certainly every child does. As soon as the eggs hatch, the surrounding jelly substance may be thrown away, merely as a mat-ter of convenience. Its use is to pro-tect the eggs and to afford the first food for the tadpole. If left too long in the water, it becomes broken up, discolored and unpleasant. The tadpoles should have fresh water every day or two, care again being exercised not to use it too cold, and they must be fed. They will eat almost anything, crumbs of crackers or bread, and bits of raw meat or fish being very acceptable. If they are well fed on meat or fish, they will grow faster and change earlier into frogs. Indeed, by underfeeding tadpoles a per-son can keep them a whole year from undergoing the changes they would have normally undergone in a few weeks.

The large bull-frog tadpoles naturally take two years to develop, though a very nutritious diet may possibly hasten them.

The tadpole has very small eyes, a very small mouth, and tiny gill openings like a fish. Indeed, so far as its life at



TADPOLES AT DIFFERENT STAGES OF GROWTH

this stage is concerned, to all intents and purposes it is a fish. It cannot live out of the water, it breathes by gills, it swims by its tail, but it has no fins. It wiggles about the jar or tank in a very lively way, and ought to have water weeds or stones to hide under, and pebbles or gravel in the bottom of the receptacle.

The ordinary tadpole, if well fed, astonishes and delights his young keepers in a few days by putting forth a pair of tiny hind legs, which generally trail behind him when he swims, though he often kicks with them, perhaps for exercise. He grows larger and his legs longer, and one day a row of fingers may be seen peeping out of his gill slit, as though out of an armhole, and then he will thrust out a forearm, then another from the other gill slit. After this, changes are rapid, and his keepers should put a stone or some firm object in the water, reaching above the surface, so that he can climb up into the air; for now his lungs are rapidly forming, and soon he can no longer breathe by gills. At this stage, his tail begins to disappear. It does not fall off, as some think, but its substance is absorbed into his body until no tail is left. Finally, his head changes its shape, his baby mouth is replaced by a wide frog mouth, his eyes stand out with projecting lids, his ear-plates showing back of them, and we have a full-grown frog.

To the child who understands the

origin of the fish eggs a few questions which he can easily answer himself will be enough to call attention to the important differences, and also to deepen the impression of the unity of life as expressed in flower, fish, and frog. The ova of the frog develop in an ovary exactly as do the ova of a fish; they develop in the same way and at the maturity of the animal. The fertilizing cells develop like those of the fish. In both cases, the reproductive elements are laid, shed, or born, when the time comes. Before the eggs of the frogs and toads are laid they have no albuminous covering. The moisture that envelops them swells up into the jelly-like mass upon coming in contact with water.

There are important differences between the frog and the fish. The frog is a more complex animal and, so to speak, more difficult to create, and it lays fewer eggs. Since there are fewer eggs they must be more carefully fertilized; that is, the fertilizing material must be sure to come in contact with all of them. Consequently at the moment when the eggs are finding their way

into the water they are fertilized; not within the female body, but just as they are leaving it.

The child accustomed to notice what he sees will observe the paired frogs in the pond. He can be told that they take this position just before the eggs are laid so that every egg will surely be fertilized. In the amphibious animals the relation of the two parents is closer than in the fishes, but yet there is no union between them, that appearing only when it is necessary. The stern law of necessity governing every step of the reproductive function may be made very impressive to the young mind; also *the reign of law* throughout life.

To explain frankly, simply, and scientifically such phenomena as that of the paired frogs will tend to rob them of dangerous interest. Not to speak of them will not prevent the child's seeing them, and his imagination may foster much less wholesome thoughts.

There are frogs and toads that care for their young, but parental affection in this form of life is rare. The eggs are laid in a favorable spot, and then

left. Toads as well as frogs lay their eggs in the water. The instinct of the toad leads it to seek the water at the egg-laying season, as its tadpole, like that of the frog, can live only in the water. At other seasons of the year the toad does not enter the water.

Frogs' eggs are laid in compact masses, while toads' eggs are laid in strings or ropes; and in this way they can be recognized, though after they have once hatched the tadpoles of both are so much alike that they cannot be told apart. Sometimes the children will be disappointed because the tadpole does not change into a frog nor yet into a toad. It gets its four legs but does not lose its tail; it never loses its tail. In short, it is not a frog or a toad, but a salamander or water-lizard, which lays eggs similar to those of the frog, and whose young upon first hatching look very much like young tadpoles.

If eggs are found in a pond where frogs are not heard or seen, they will almost always turn out to be the eggs of a salamander.

# X

## THE BIRD

FROM the flower to the bird is a step easily taken if the parent prefers to omit the intermediate steps, or, after the story of the bird has been told, the stories of fish and frog can follow as occasion offers, instead of preceding it. The bird is peculiarly valuable in teaching the origin of life to the child, since in it we have such highly developed home and family instincts, the father bearing his share of the burden, illustrations of which are rare in the lower forms of life. As everywhere else, the best starting-point is with the life and interests of the bird itself, and for this caged birds are far better than the free ones, even though they may be only the sparrows and pigeons of the city streets.

The flight of birds is that which particularly interests children as well as every one else. Birds will soon learn

to come to a place where they are fed regularly; and the style of flight, depending upon the size and shape of the wing as well as the shape of the bird's body, is a very interesting study. Many a country child knows the common birds by their flight even when the bird is too far away and moving too fast to be distinctly seen. What he generally does not think of is *why* the bird has this peculiar flight, and to have his attention called to it may increase his interest in watching the living bird.

Whatever increases the boy's interest in the live bird tends to decrease his desire to make it a dead bird; and the numerous good bird-books, as well as the substitution in so many cases of the camera for the gun, has tended to preserve the lives of the birds and to create a sentiment in favor of their preservation. If the young child is taught to watch the birds and care for them, he will not often, when older, thirst to take their lives.

While the flight of the bird may engage the first interest of the child, its manner of eating and drinking is worth

attention, and the nature of its food is of the greatest importance. The shape of the bird's beak will decide, at least in a general way, the kind of food it eats; and a little study of birds will convince any one that all birds are useful to the agriculturist, either as destroyers of noxious insects or of weed seeds. While some birds swallow the seeds whole and pass them again unharmed, thus spreading the plant, others crack the seed coat and eat the contents, which of course destroys the seed. Even where the birds are the means of sowing seeds they do more good than harm; for the seeds thus sown are not often harmful, and those same birds destroy a vast number of noxious insects. Even owls and hawks, by destroying mice in the farmer's fields, do him a service that much more than compensates for the loss of an occasional chicken.

While the birds are of inestimable value to the farmer and to any one who has a garden, their influence on our lives in another direction is also very great, as difficult to estimate perhaps, as that of flowers. Who can doubt that these little

brothers of the air are one of the most civilizing and elevating factors in man's daily life? Their song, their flight, their thousand and one charming or entertaining habits, their strong expression of personality, their poetical and mysterious comings and goings, appeal powerfully to the higher imagination.

The migration of birds is alone enough to fill the mind with enchanting dreams. To know that every night in late summer and in autumn there is a stream of birds moving high in the air along the line of the sea-coast and of the great valleys is enough to awaken fancy. This winged procession moving along its aerial highway is made of the small and timid birds that dare not fly by day for fear of hawks and other enemies; they may be as high as three miles above the surface of the earth, their height being estimated by watching them through the telescope as they cross the surface of the moon. Imagine looking through the telescope at the face of the full moon some night and seeing an endless procession of little birds speeding across its shining face!

The amazing power of birds to see and hear, and, most interesting of all, their nest-building habits are calculated to arouse the wonder and admiration of every observer. What child would not watch with intense interest the bringing of the straws or other materials, and the deft weaving of them into the home which is presently to receive the precious eggs? Even the city sparrow may here be a boon to the mother. Sufficiently encouraged, it will accommodatingly build almost anywhere.

The child who knows the story of fish life and frog life will need little telling here, and that is one argument in favor of taking all the gradual steps from flower to bird. By this time the main ideas are firmly lodged, the child will readily draw his own conclusions as to the rest; but there are one or two facts connected with the origin of the bird which are of great value in fixing the idea of *necessity* which is at the foundation of all reproductive phenomena. Everything is as it is because it is necessary that it should be so. In the frog the higher development made

necessary greater economy in the production of the egg and the fertilizing cell, and this economy of material necessitated the more certain fertilization of the egg.

In the bird a great step upwards has been taken. Here we have something much more complex in every way. The frog was cold-blooded, comparatively sluggish, and comparatively simple in structure. The bird is warm-blooded, intensely active, and very much more complex both in bodily structure and in mind development. Here the reproductive activity is yet more economically conducted, and instead of thirty or more eggs, the bird produces often not more than six in a season, and even a smaller number if it is single-brooded, some eagles, for instance, rearing only two young in a season. Naturally these few eggs must be very carefully protected. Since they are not laid in the yielding medium of water, they cannot have so soft a covering as the eggs of the fish or frog, but are enclosed in a hard shell. This shell must of course be formed before the egg is laid, and the egg must be fertilized

before the hard shell encloses it and thus makes forever impossible the entrance of the fertilizing cell.

The ovaries of the bird are in the small of the back close to the backbone, and there is a tube called the oviduct or egg-duct, leading from the ovary down to the lower end of the intestine, which it enters. There is no separate opening for the oviduct into the outer world.

There are two ovaries, with their oviducts, in the young bird, but these are so small that it is very difficult indeed to find them. As the bird approaches maturity, one ovary and its oviduct enlarge, and the ova, which develop from the inside of the ovary just as the ovule develops inside the flower ovary, also become large. Although the bird is born with two ovaries, but one, usually, develops, generally the one on the left side.

When the bird comes to maturity, there is born in it a yearning for home and offspring. As the eggs develop, the bird turns to the nest and to the mate who is to share with her all this beautiful life. When the mate has been chosen,

both prepare the nest to receive the eggs, which will soon be ready. It is during this period that the fertilizing fluid is placed in the lower end of the egg-duct, whence the fertilizing cells, by their power of motion, quickly make their way to the egg, which has just begun its journey down the oviduct and is as yet without a shell. The shell-less egg is well known to most country children, as hens often lay one; and this will always happen where there is not lime enough in the food of the poultry.

After the egg is fertilized it continues its slow journey down the oviduct, which enlarges to accommodate it. At first the egg consists of the yolk alone. This grows to its full size before it leaves the ovary. The yolk in short *is* the egg. But there is not enough food material in it for the development of the bird, so as it passes down the egg-duct it becomes coated by the so-called "white" of the egg, which is a substance secreted from the lining of the egg-duct and is not alive, as is a certain part of the yolk. It is merely stored-up food like that in the morning-glory seed, for this egg is

the seed of the bird. At the lower end of the egg-duct there is secreted a limy liquid which covers the shell-less egg and hardens, making the shell. So finally the fertilized egg has its shell and is ready to be laid. When this time comes, the bird seeks her nest, and the egg is laid or born, and lies warm and living, like a jewel in the nest.

It is hardly necessary to add that the fertilizing cells in the male bird have an origin similar to that of the ova. The testicles and their ducts are too small to be easily seen in the young bird and in the winter-time, but can be seen during reproductive activity. The male bird can usually be told from the female by differences in color and plumage, but where this is not the case the two sexes cannot be told apart without actually killing and dissecting the birds, so very simple are the generative organs.

The ripening of the reproductive elements in the bird occurs in the spring of the year, and is always with a few exceptions accompanied by the instinct of nest-making. The birds instinctively and joyfully prepare the home for their

young at this time, both parents joining to make the pretty structure. With the child the higher emotions which always accompany reproductive activity in the bird life should be kept ever prominent, — the affection between the parents, their care and love for each other, the care and love for the helpless young, their happiness in this duty as shown in their song and bright colors. Unlike the fish and the frog, the bird cannot develop unless the egg is kept warm, and after it hatches the young bird cannot take care of itself for several weeks. It must be carefully nurtured, and finally even taught how to fly and find its food.

The maternal hen can be a treasure to the mother seeking to impress the lesson of love and care; the only defect is the indifference of the father, which is in marked contrast to the interest shown by other birds, though there are many proofs that the cock is not without parental love, as where young chicks have been abandoned he has been known to rear them.

The love of both the birds for their helpless young, and their devotion to each

other, can be impressed on the young mind in many a picture of beauty. Many birds pair for life, returning to the same nest year after year. Nor should the instruction fail to impress upon the young mind the advance of love and tenderness on the parent for the offspring as we ascend the scale of life. The flowers, the fishes, the frogs, entrust their offspring to the care of Mother Nature; the birds cannot do this. The mother and the father of the helpless little creatures take deep joy in sacrificing their own freedom and strength and time to this loving duty. A bird will even lose its life for its young, trying to drive off an enemy; and every one knows how dangerous it is to approach the nest of any large bird, eagles and even cranes sometimes killing men and boys who try to rob them of their young.

The plumage of birds is a pretty subject of study. The wonderful way in which feathers are adapted to their use, in keeping the bird warm without greatly increasing its weight or impeding its flight, may be made very interesting; also their beauty both of structure and

color, and the fact that at maturity the plumage often undergoes remarkable changes. Young birds are colored like the mother. The brilliant male of the Baltimore oriole gets his bright dress at maturity, but until that time he is as soberly clad as his quiet little mother.

The inheritance of the young bird from its father should be enlarged upon. At the beginning, though the male birds resemble the mother in appearance, at maturity they wake up to the characteristics of their father. Then the brilliant colors begin to play over their feathers — his colors. Then the song trembles from their throats — his song; and the beautiful creatures might sing as their wonderful wings flash through the air, "All this loveliness I owe to my father: it is from him I received this glorious heritage of beauty and song."

The child can learn the terrible consequences to the birds of their feathers being taken as ornaments by human beings. The children can be told that the plumage is most beautiful at the mating and nesting season, and that thousands of birds, both male and

female, are slain then, that the eggs and young birds consequently die, and that some species have been almost if not quite exterminated in this cruel way. The Audubon societies are organized for the purpose of instructing young people about the birds and getting their coöperation in opposing this needless slaughter. Some of these organizations are extremely interesting in their field and lecture work on birds; every neighborhood could have its Audubon society, to the great pleasure and profit of the members as well as to the profit of the birds.

Where the mother desires to pass directly from the flower to the bird, this can be well done by comparing the two, so far as their generative processes are concerned, at every step. She can remind the little one of how the flower seed is treasured in the ovary until it is able to go out into the big world, and can then tell him that the wonderful seed of the bird, which we call the egg, is treasured in the same way; this to be followed by the story of the care needed by the bird's egg after it is born,

—how it cannot be left to shift for itself, but must be watched over and kept warm by its loving little parents until it is fit to leave the shell, how it then breaks its prison and comes forth so weak and helpless to be yet further loved and cared for and taught by its faithful parents.

The question is often asked, should not the story of motherhood precede that of fatherhood in all this early teaching? Up to a certain point it may be well, and the story of the life and development of the egg can be told to young children, with the father-bird merely an æsthetic factor, so to speak. His care of the young, and protection of the mother-bird can be dilated upon without going any farther. This is a course, however, which it will not be wise to follow too long, particularly with boys, whose interest will be greater when they know that the father too has a vital interest in the life of his offspring. Moreover, there is a certain spiritual value in connecting the equal need and responsibility of both parents in the creation of their offspring. The child then knows

that he has the whole truth, and half truths are never quite safe.

If the child knows the story of flower, fish, and frog life, he will draw his own conclusions about the birds, and it will be wiser frankly to tell him this part of the story. If he knows nothing of the earlier work, and the mother begins with the young birds in the nest, according to his age and surroundings he should be told more or less, the mother always remembering that if she defers too long somebody may anticipate her with the kind of information she particularly desires to avoid.

Another question often asked concerning the bird is, "Would the egg be laid if it were not fertilized?" It might be or it might not. In all forms of life the sensitive reproductive system responds with peculiar readiness to its environment. In birds if it does not receive the stimulus that comes from mating, the ova may not develop at all, but remain small and attached to the ovary. Or, a few may be completed and laid, as is often seen in the case of caged female canaries. But these eggs of course

could never hatch. They are perfect so far as the ovum is concerned, but lacking fertilization they cannot continue their development.

Another question often asked, and of peculiar meaning, is, "If the reproductive system be not exercised, will it not perish for lack of exercise?" The latest word of science on this subject is that it will not, either in the bird or elsewhere. In a healthy organism it can safely remain inoperative with the certainty of becoming active at a later period if then it receive the normal stimulus.

The lessons to be learned from the birds are many. From them can be answered all questions, for now we have passed that most difficult of all points, the relation of father to child in the animal world, and everything else can be explained through the knowledge already gained. The well-taught child will recognize the justice and necessity for the existing processes of life. He will realize their deep meaning, their far-reaching influence, and their tremendous importance in preserving upon the earth the

multitudes of living forms that inhabit it.

The flower and the bird are the two most important helps in imparting the facts concerning the renewal of life throughout nature.

# XI

## THE MAMMAL

THE mother who has conducted the child through the various life forms up to the mammal will not be likely to wish to stop there. Having gone thus far, it will be easy to continue and reveal to the child the wonderful life that yet remains.

The question is often asked, whether country children are not much more likely to learn these truths naturally and without instruction than city children. The answer is that they are more likely to learn the facts, but knowing the facts is by no means understanding the subject; and whether knowledge of the facts is good or bad for the child depends entirely upon the impression it makes upon him. Undoubtedly the country child is in a better position to receive instruction, but whether this

instruction tends to refine his feelings and elevate his heart depends altogether upon how it is given. Probably the average country boy has no more spiritual conception of the matter than the average city boy, though he may have a more wholesome and, so to speak, utilitarian thought of it. His interest at least reaches out to results, for the successful multiplication of the stock on the farm may be a matter of vital importance to him.

The extension of knowledge from the bird to the mammal may be made through the medium of the family pets. Fido, puss, the pet rabbits, or squirrels may serve to elucidate the subject. Indeed, at this stage the well-instructed child himself will be ready to give all the essential facts, and will feel free to ask questions concerning the facts he does not understand. If he has traced the continuity of the egg from the flower to the bird it will not be difficult for him to realize that even the higher animal has its origin in the same way. The mother can very reverently explain to him that the cat too has ovaries; that

from these develop ova which are few in number and need very special care. They cannot be laid in a nest like the bird's egg. They are very tiny, no larger than the head of a small pin, and they have no hard shell.

It is their destiny to remain in the oviduct and develop. That is, instead of being born like the bird's egg and then being hatched, these eggs first develop and afterwards are born. But if not fertilized they would not continue to develop. The cat has two ovaries, which develop at maturity and ripen the ova, and these pass into the oviducts, which are tubes like the oviducts of the bird. Here the egg remains a certain length of time, and then if it is not fertilized it is passed away; but if it is fertilized a marvellous change takes place in this tiny cell: it remains within the oviduct and is there supplied with nourishment by blood-vessels essentially as the flower seed is supplied with food from the sap. Generally three or five of these ova develop at the same time, some in one oviduct, some in the other. When these tiny eggs have developed into kittens

strong enough and perfect enough to make entrance into the world safe, they are born just as the egg is born. Unlike the oviduct of the bird, which opens into the intestine, these ducts unite just before the end, and have separate openings of their own.

As soon as the young are born the mother begins to care for them. For several weeks they depend upon the milk she secretes for their food, and upon her constant care and loving watchfulness for their life. The thought of parental love and care should be much more strongly emphasized at every step than the mere physical facts, though it is necessary that they too be clearly comprehended. The sacrifice of the parent for the child is one of the most universal and unselfish facts of life, and many stories illustrating it can be collected and told. It is not necessary to tell them as obviously pointing a moral, yet they should be told as dramatically and interestingly as possible, that the child may get a strong impression of this great force. Among mammals it is true, (but this need not be dwelt upon

with the child,) that many males pay no attention to their offspring; though some, as the cattle, defend the females and young if a herd is attacked by savage animals, by putting them in the centre and themselves forming a circle about them. It is the mother love and care, however, which are here most prominent; but the child who knows the facts concerning paternity should not be allowed to forget the great factor of inheritance, and that the offspring gets its characteristics from the father as well as from the mother.

There is only one more step to be taken in the *modus operandi* of reproduction, and that is in the higher mammal, where the ovum passes down through a slender oviduct into an enlarged chamber or womb, where it remains a certain length of time, finally if unfertilized, to pass away unnoticed; if fertilized, to develop into a young animal which in time will be born helpless and dependent upon the love and care of the mother. In some of the higher mammals, as the sheep and the goat, there are generally two ova developed in the womb at the

same time; that is, twins are born. In the larger ones, as the horse and the cow, but one ovum generally develops, though the development of two is not uncommon.

As a result of these teachings, which are not formal like school work, but given as opportunity offers and in as interesting and outreaching a way as possible, the child learns that all life develops in the same way. That all life, even human, starts as a tiny ovum. That these tiny ova are produced in every female by a special tissue called the ovary, which develops at maturity when the eggs begin to ripen; that if the ova are not fertilized they do not develop; if they are fertilized they develop into an individual like the parent, though having personal peculiarities of its own. The fertilizing cells are produced in every male from a special tissue, which greatly develops at maturity when the fertilizing cells are matured and are capable of uniting with the ovum to produce the new being.

Along with these necessarily material facts the youth is firmly impressed

with the high office of this great function, his thoughts concerning it are honest and clear, and he understands in a natural way the necessity for respecting it and guarding it for the good of those who are to follow. The essential facts the child can well learn before his own maturity. They seem to him matter-of-fact, like any other phenomena of life. He does not need to brood over an incomprehensible and veiled mystery, and the whole subject cannot fail to have a broader significance, a deeper, wider meaning, a purer influence than it could have if only the physiological facts relating to his own life came to his knowledge.

But should one wait for all these intermediate steps before telling the facts of human life?

That perhaps depends upon the temperament and circumstances of the parent and the needs of the child. It does not matter much whether the steps are taken consecutively or not, so long as the child gets a clear idea of the main facts and connects them in his mind with similar phenomena in all forms of life. Nor is

a great store of knowledge on the part of the parent necessary. Each will tell in his own way such facts as he knows, keeping only in mind that he is to impress the child with the wonder and beauty of reproduction as a means to an end, and as a universal law working essentially alike in every living thing.

There is something deeper than mere knowing, which the parent wishes to kindle, like a sacred fire which can never be extinguished, in the soul of his child. That is, a high reverence for the noble mystery of human life in its inception, and a deep love for his parents and a profound faith in them, such a love and reverence that any impulse to subvert the forces of his own life may be met with successful resistance.

The boy who hears from his mother's lips his first knowledge of his own origin, who learns from her the full meaning of maternity, its sacrifices and suffering and the great love that gladly endures all, suffers all, for the sake of the precious child who is to come to her arms, — for the young life, his life, that she is to guide and cherish, — can never enshrine a

debased image of womanhood in his heart of hearts. With some children — and some mothers — this might well be the child's first introduction to the subject. Afterwards he could be shown the flower and its seeds, the fish and its eggs, the egg of the bird, and somewhat later introduced to the pollen of the flower as necessary to the completing of the wonderful transformation.

Nor will it be difficult in these growing years to instil into the boy the best elements of chivalry which shall make him a champion for his mother's sex. He ought to be trained to a certain respect and courtesy toward girls and women as he grows older, by many devices in the home life which will suggest themselves to any mother. A feeling of protection for motherhood can be fostered in the boy through his relations with the lower animals; many a one has had the truth impressed upon him by his mother's admonition not to handle kitty roughly or chase her about too much, as she is carrying under her heart the burden of new life. Keeping and caring for pets may be a great education to

the growing boy. It interests him in animal life, gives him occupation at home; and in breeding his pigeons, rabbits, or squirrels his interest in obtaining good specimens may be an open door to instruction of inestimable value far beyond pigeons and rabbits.

Again, the boy's pet may by some mothers be found an easy introduction to the story of the development of the new life, the main stress being laid upon the care of the little mother, who must be treated with special kindness and consideration, and must be well fed. Some mothers encourage the children to save a little of their own milk and cream for pussy at this time, thus conveying the impression that some sacrifice of their own comfort is due to the mother who is bearing this extra burden of life. If the child is curious, the mother can tell him so sacredly the principal physiological facts that he will go from her feeling as little inclination to speak carelessly of what he has heard as he would feel like shouting his prayers aloud in the street.

It will naturally occur to the mother

to connect this whole subject closely with the religious thought of the child; and where this is done simply and without theology, but as an expression of the great divine love and foresight that passes like a golden thread through every form of living creature, it may be exceedingly beautiful and exceedingly helpful.

It is now time to answer the question, "What is to be done with the older child who has received little or no preliminary instruction?"

From eleven to fourteen the boy can be told the facts he needs to know with as much preparatory flower and animal studies as can be made interesting to him. Everything will depend upon his temperament and the kind of information he may have already received. He may be interested; the chances are he will not be, or at least will pretend he is not. In such a case he must be made to listen, and some such preliminary as the following will generally attain the required result.

"There are some things that every man must understand rightly. I want to be sure you understand them, so

that you may know the true from the false, the right from the wrong, and will not show yourself ignorant before the world."

Generally to be seriously called a man at this age, or invited to enter the domain of the man, will conquer, and he will listen even though he may pretend not to. It often happens that the boy entering the "contrary age" wants above all things to know, and yet is ashamed to listen. It is generally safer to talk to the boy at this time than to rely wholly upon books to be read by him. Give him the books by all means but talk them over with him, supplementing them in any way that seems best. It may be better for the father to talk to the hitherto uninstructed lad at this age, but where this is not possible then the mother should see that the boy has the information he needs, in the most out-reaching form she can bestow it, trying to make him realize the universality of the truth, the fact that every living thing is subject to essentially the same sex laws. It is best for him to feel that both parents understand and are interested in

this side of his development, and the mother, even though the father gives the instruction, may be able to show her son that she too knows and cares. It will be much less difficult as a rule for the mother to talk to the girl at this age, and of course there will be many children, both boys and girls, with whom no difficulty will be encountered.

With older children, those perhaps from fourteen to eighteen, yet other methods may need to be pursued. Many youths can be approached without difficulty, and what they need to know can be explained directly to them. Whether this is so or not often depends quite as much on the parent as on the child. Where the mother feels that a direct appeal to the youth would be injudicious she can sometimes gain his interest by indirect methods. If there are younger children she can introduce the subject by saying that she is anxious to have the children instructed properly in this subject, and that she relies upon him to assist her in various ways, and particularly by always understanding what she is doing, and adding the weight of

his influence as an older brother. She can then consult him as to the best way of going to work, explaining about the botany work and what she hopes to gain by using it, all the time taking for granted that he knows everything. If he is interested, she can explain all to him in this way, opening the door to certain other information she must be sure that he has. Of course she may be able to relegate all this instruction to the child's father, but if for any reason this is not possible, the boy must get his help either directly or indirectly from her; and in any case if it is possible to associate him with her in the task of enlightening and helping his younger brothers it may give a certain definiteness of thought on the subject, and, what is of more importance, a sense of responsibility in regard to it. It will also help him to a realization of the universal nature of the manifestation of this side of life. By occasional appeals to his sympathy and help as time goes on and getting him to read certain books in order to help her to decide whether they would help the others, she may be able to do him

an incalculable benefit. Even though he may argue against instruction, that will give an opportunity to put in his way sources of knowledge, and if he does not feel inclined to read the books recommended they can be left in his way where he can read them without being detected, which he will be apt to do. Generally young people are eager for instruction, though where they have been neglected and have formed false ideas and ideals they sometimes become perverse, particularly toward members of their own family. This may often be due to fear in one form or another, and the wise parent will leave no means untried to give the youth somehow the help he needs. Many parents feel it wise to give the youth some good book on the subject suited to his age, a book of his own which he can keep in his room to consult whenever he is puzzled or doubtful about his rule of conduct.

## XII

### VIGILANCE

THAT the facts concerning the normal reproductive life throughout nature can be presented in such a way as to create a worthy image in the mind of the learner there can be no doubt.

The question naturally arises, "Is this enough to insure morality and personal purity in the youth?" Few knowing the tendency of the age would hesitate to say most emphatically that it is not enough.

The end in view being to prepare the young soul for the great battle of life, to put upon it the armor of a knight which shall be borne untarnished, the first instruction concerning the facts of the reproductive life may well be impersonal, poetical, beautiful, filling the mind with sentiment, — not sentimentality, — so that the mental vision of this side of life shall be one worthy of the glorious

mind of man. To keep the mind of the child wisely impressed with the beauty, the achievements, of the great reproductive force in nature, which is directly responsible for every living thing on the earth, is to help immeasurably toward branding a high instead of a low ideal on his soul, — an ideal which he cannot lose when he reaches the great climax that transforms him into an adult capable of reproducing his kind, and when whatever most powerfully influences him will become a determining factor in the administration of his whole after life.

Side by side, however, with this illumination of nature's methods should go the most careful training and watchfulness in the care of the child's own person, — not that he need connect the two in the least. Later, of course, he will, and should as time goes on, have the most careful instruction concerning his own body and its functions. There are a few simple observances that every human being should learn from childhood, and learn so thoroughly and so fix as a matter of habit, that he can never break away from them.

At first the parent attends to the child's wants, later the child must care for himself; and while he ought not to be burdened with too much thought of his body, yet there are a few simple rules of hygiene which he should follow as a matter of habit, and there is one subject upon which he should be most carefully instructed, — that is, maintaining the sexual purity of his body. He should be taught from the beginning to think of his body as the sacred temple of his soul, which it is a sin against nature and against God to defile. That the child's body be kept uncontaminated is one of the most priceless gifts his parents can bestow upon him; the value of this was so keenly felt in antiquity that at a certain period of Greek supremacy the laws were most stringent concerning it, a youth sinning against himself being put to death.

There seems to be a growing need of watchfulness over children in this respect; few who have not looked especially into the matter have any idea of the prevalence of harmful habits. Sex abuse has been called "the disease of

civilization"; and where it takes firm root, it is exceedingly disastrous to the life of a nation, not only destroying, directly or indirectly, individuals, but so weakening the stock that the whole nation degenerates.

The root of the difficulty perhaps lies in the low ideal of this age on that subject. Where the ideal is low there can be no hope of a high result. That the current theories which control the lives of the many in this direction are false is the conclusion of the best scientific work of the present times. Where these theories, however, have been bred into youth for generations, they may to an extent be true simply as a result of this breeding. Darwin in his "Descent of Man" says: "It is worthy of remark that a belief constantly inculcated during the early years of life, whilst the brain is impressible, appears to acquire almost the nature of an instinct; and the very essence of an instinct is that it is followed independently of reason."

For the parent, then, to inculcate this quasi instinct against sex abuse in any

form is to give the child the best armor he could possibly have; and if this could be done for generations, the instinct would not need such careful fostering, as it would be born more or less developed with the child.

Every parent of a purely reared child is putting a stone in the foundation of prosperity for this wonderful new civilization, which will go on evolving, or die of decrepitude, just as its central dynamic force, the sex life of the people, finally decides. Sex immorality is, as every one knows, one of the signs of the approaching death of a nation.

Few young mothers realize the great need of watchfulness against the formation of bad habits in even young children. And many make the mistake of supposing that with children instruction can take the place of watchfulness. During the early years of a child's life careful watching as well as careful teaching, is necessary. Nor does the social grade of the child bring immunity or the reverse. The mother who says to herself, "Oh, *my* child would not," does not understand the nature of the problem. Anybody's

child may innocently fall into this error, and every mother should equip herself with all the information necessary to guard against this most insidious of all foes and to meet it if it appears, realizing that watchfulness is necessary almost from the hour of birth, — even children in the cradle frequently needing attention in this respect. Every young mother should know that among a certain class of people, from whom her nurse will likely be drawn, there are many who have theories most pernicious to the welfare of the child, the nurse herself not infrequently, through ignorance perhaps, being guilty of initiating the babe into a course from which it will be most difficult for him ever to depart. It is not safe to take for granted that any child does not need a certain amount of watchfulness. The most highly organized, most "high strung" sensitive natures are among those most in danger, not only from forming unfortunate habits, but from their results.

Watchfulness during the early years of the child's life, instruction in caring for himself, plenty of outdoor exercise,

unstimulating food, sufficient sleep, the cold bath, agreeable occupation, abundant material for wholesome thought and imagination, will in most cases bring the child safely to the first great milestone in his life journey, the period of adolescence.

As the child grows older he should be warned against certain dangers which may beset him from other vicious or ignorant children; and of course the child's temperament, his heredity, the weakness or strength of his desires in the direction of sense pleasures, and the amount of will-power he possesses will guide the parent in the nature and amount of such instruction. Some mothers whose children have strong animal instincts are afraid to instruct them on that account. Such children are in peculiar need of watchfulness and knowledge, and the right kind of instruction does not tend to waken the senses. Of course no child should be sent away to school without an impressive warning against certain habits all too prevalent among boys in boarding schools. Here it may be wise to let him know something of what he will be sure to see or hear, that he may

not be taken unawares, puzzled and tempted by things which to him will seem not to have come within the experience of his parents if they said nothing to him about them. The boy warned by his parents of the falsity of the strange doctrines he may hear preached by these unguided youths will not readily be deluded. The pure but ignorant boy going for the first time into the new life of the school, looking up to the older boys with that peculiar veneration the younger boy almost always feels for the older, moved in his senses by what he hears and sees, may speedily forget such home warnings as seem vague and pointless, and he may yield himself to a course most disastrous to his future.

How can it fail to be the duty of every parent to protect the child against the chance of making these fatal mistakes through ignorance? Young people cannot be kept wholly out of reach of temptation, nor would it be best for them if they could be. Far better is it so to strengthen the moral fibre that they can resist.

From time to time there appears in

our best publications an appeal from some noted educator for the better instruction of youth at home, and their almost universal plea is that the youth be told by the mother the facts needed to give him a reverence for womanhood.

# XIII

## THE TRANSFORMATION

THE most difficult problems of the educator are found in connection with changes which take place in the child at the age of adolescence or puberty. This age has never been so carefully and systematically studied as at the present time, and it is proving an unsuspected key for solving many puzzling problems of racial evolution as well as of individual development. Personally it is a time of tremendous stress, — physical, mental, and moral; the young person who escapes turmoil being the exception, not the rule.

Certain of the physical changes which occur are familiar to all, but the deep meaning of these changes is less generally understood. The parent who has wisely guided the child to this critical period has done much, but it would be

a mistake to suppose that all has now been done that can be done.

The habits of self-reliance, self-control, and right thinking formed through the years of childhood will indeed help now. But there awakens for the first time a new force: the child is, in a literal as well as figurative sense, being born anew. At this new birth, which is sometimes very difficult, he enters into a hitherto unknown world of interests and feelings. While the change from child to adult may proceed as a gradual and placid unfolding in some individuals, in the great majority it advances with irregular and disturbing demonstrations. This great change takes place in girls generally at from thirteen to fifteen, and in boys a year or two later, though it is not completed for a period of five or six years. During this time the most profound alterations take place in nearly all parts of the body; the mind undergoes a similar metamorphosis, so that often the child so carefully watched from babyhood seems entirely superseded by a new being.

This is preëminently the age of

romance. It is the borderland where is fought the battle of individuality, and it is probable that at this time is decided in a very deep way what is to be the trend of the whole after life. There is at this period such susceptibility to impressions that there may be indelibly stamped mental images that are the exact opposite of those of childhood, the childish memory remaining as a thing apart and by itself, — a curious separation and continuation of two lines of ideas, which every one has perhaps experienced to some extent and on some subject.

It is probable that impressions received now are of more importance in determining conduct than at any other period, or at least in determining it for a long period of years, the period when the individual makes his strongest impression upon the world. Reversion to the faith or the ideals of childhood, which so often occurs in old age, is of slight importance to society as compared to the influence of the individual when at the zenith of his powers. Consequently, it is of the utmost importance that the right thought and the high ideal be firmly implanted at

this new birth. Undoubtedly the habits of childhood make impressions in the same direction more easily received, and where self-indulgence and gratification of the senses have been prominent, they will be sure to exert a tremendous power now, and *vice versa*. Thus a clear understanding of this period is of the utmost importance to whoever undertakes the guidance of youth.

The central point about which everything now revolves is the coming to maturity of the sexual system. It is as absurd as it is harmful to ignore the fact that this is primarily what the change means, and that with the physical power to become a parent there normally appears, either initially or with greatly increased force, the sex appetite. This is normally true of both boys and girls, though the forces that have gone to make our present civilization have, at least in many cases, made the physiological sense cry subordinate in the girl, and occasionally this is also true of the boy.

There is no period in the life of the human being when he so needs help in certain ways as now, and no time when

it is so difficult to help him, as every youth now more than ever before affords an individual problem. One of the difficulties attending this period is the tendency to unsymmetrical growth. Oftentimes the body shoots up with amazing rapidity, this quick growth of bone and muscle drawing heavily on the whole system; parents recognize the condition by saying the child has outgrown his strength. He has often outgrown much more than this, for his intellect may not have been able to keep pace, and we not infrequently have the anomaly of an adult body with the mind of a child. No one is more conscious of this incongruity than the subject himself, whose anatomy seems to have run away with him. This rapid growth is generally marked by excessive development of some parts over others, so that the child becomes clumsy and awkward. If the subject is a boy, the sudden change in the size of his vocal chords often causes a distressing "breaking" of the voice which adds materially to the general sense of disharmony.

Those who have not experienced this

sudden and unsymmetrical development can have little idea of the trials of the young soul going through it, a suffering so great that suicide is often seriously contemplated as the only solution. And all this turmoil is kept within the heart of the sufferer. To the outsider the boy, the girl, is merely "cranky" or "contrary." If not constantly nagged at and reproved for his awkwardness at home, he is sure to have it ridiculed by his schoolmates, particularly by those of the opposite sex. He cannot help being round-shouldered and loose-jointed, with protruding shoulder-blades and awkward motions; and the pathos of it is, he thinks he must always remain so, an ugly failure and a laughing-stock to the community. The effect this has upon him will depend upon his temperament. Very sensitive and fine natures often instinctively seek to cover the real trouble by exaggerating the defects in every way possible, — making believe they do it all on purpose, and acting the clown and the ruffian, giving way to the irritability natural to the condition with a sort of reckless despair which is sure to be misunderstood and

censured by those he loves best. When this stage is reached, it is easy for him to imagine himself a social outcast, a useless encumbrance that nobody loves, a clumsy dolt that nobody likes to have about. Again he may become sullen, morose, resentful, and suspicious toward all about him. Or, a timid nature may become more timid, shrinking, weak of will, and despondent concerning life in general; or the subject may show an exaggerated egotism which seeks by sheer intrusion of self to force everything else aside.

In the course of a few years he grows out of these difficulties, but the suffering he underwent may have made such an impression upon his excessively sensitive nerve centres that he never entirely recovers from it, and may be controlled by it in ways he does not suspect all the rest of his life.

It is needless to say that a large part of this suffering could be averted by knowledge on the part of the parents and of other adults with whom the youth comes in contact, as well as on the part of the youth himself. What

he most needs in his "awkward age" is sympathy, patience, firmness, and instruction, and his physical defects should never be ridiculed. Perhaps nothing is more helpful to youth at this stage than to have its vagaries treated seriously. Wonderful dreams of future glory and accomplishment, remarkable theories of the universe, astounding schemes for impossible inventions, new Utopias, wild adventures, and at times even questionable escapades are the natural and luxurious growth of the newly stimulated imagination. They do no harm, and are a safety valve which should be understood. Honest sympathy, where sympathy is merited, will give weight to warning and disapproval, which would have no weight at all if the whole fabric of the imagination, which is so real and so precious to the imaginer, were condemned without discrimination. These dreams of youth are often the real stuff out of which the fabric of life is later to be woven, taking new forms it may be, but getting their inception there. Some one has said that if the facts could be known, the thought germs whence finally

came the steam engine and the electric telegraph were probably conceived in the brain of an adolescent; and we know that poets are born at that age.

Many of the dreams of the youth may seem fantastic and ridiculous, but if the adult can only remember that they are not so to the dreamer and that this is a phase through which he is passing, — a phase which in most cases will pass entirely, leaving only, so to speak, a glow behind, — he will be more sympathetic and thus more helpful. If he can also realize that these dreams of the youth are an expression on the highest plane of the creative instinct which is in a sense controlling his body, mind, and soul, these vagaries, far from being ridiculous, will be recognized as worthy of the deepest respect. Now, too, the parent who has won the full confidence of the child through confidential talks on sex matters can without difficulty instruct him in the meaning and control of the new forces that are at work upon him.

The whole subject now changes. It becomes personal, and his thoughts are clouded by new problems and by the

imperious demands of the body. According to the nature, inheritance, and previous habits of the youth these demands assert themselves. And now is the time of greatest danger from ignorance. Even though the boy has been well taught up to this age, if he is cast adrift now on the turbulent sea of desire and allowed to gather information from the sources all too available, there may occur a split between the thought of his childhood on this subject and the thought of his adulthood. If he is not allowed to drift, however, but given a chart and compass, the knowledge he has already of how to sail his ship will enable him to make straight for the right port, which he will have a good chance of reaching, no matter how stormy the seas he may have to traverse. With the right knowledge now, the idea and the ideal of his childhood may become the idea and the ideal of his manhood. If the child's thought of the subject has been unworthy, the danger of forever enshrining a wrong image in the soul of the adult is greater, and the difficulty of placing there the right one is enhanced.

The outward signs of the girl's development are usually explained beforehand sufficiently to enable her properly to care for herself. It is unnecessary to add that this should always be done, as nothing is more unjust than to leave her in a state of ignorance where the natural expression of her maturity may fill her mind with fears which may affect her nervous system ever after, even if they do not lead her to do acts which may permanently impair her reproductive vitality, and injure her health in other ways. All that she needs to know about the proper care of her person should be told her in the most considerate yet explicit manner, as should whatever is told her upon any part of the subject. It is a mistake to be vague now. Whatever is told concerning the reproductive processes should be said with the greatest clearness, leaving no room for brooding and imagination. And here, too, the wise parent will take into account the phenomenon of desire, which, so far from being abnormal in the girl, is normal in the truest sense. It may not play an important part in her life at this time, and often it

does not, but again it may. Nor is the girl of whom this latter is true in any sense less fine or less worthy; perhaps on the contrary she is the best product of her race. Nor should she be afraid or ashamed of her nature, but only helped to understand and take care of herself and of her powers.

With the youth at this period the changes that fit him for his new place in the world are generally ignored. He does not know what is normal and what abnormal in his physiological development, and is often the victim of groundless fears that use up his strength or send him in despair to seek assistance from the most easily available sources of information, those baleful writings and despicable quack practitioners everywhere soliciting and alarming youth, and whose career forms one of the saddest commentaries on the state of our civilization.

The young man should know the truth about himself. He should understand the vast range of the change that is taking place in him, and that no two individuals necessarily develop just alike, either physically or mentally; and he

should understand what are its normal phenomena, and how without fear to recognize and control deviations from them. Many parents direct the boy to go at once to the family physician if he is troubled or puzzled in any way. A few moments' talk with a wise doctor may save much useless worry. The more nervous and sensitive the boy at this time the more likely he will be to suffer from imagined troubles, and the greater his danger of falling into real ones.

While the youth must know the physiological and anatomical facts and must know in a general way the consequences of vice, he will seldom be restrained or helped by the methods of the alarmist. It is far better that his mind at this time dwell upon the normal and noble side of sex life than on its abnormal and ignoble side. The value of diet, cold water, exercise, and occupation should be understood by the young people themselves, and also the tremendous value of thought in helping or hindering. Faith in one's power to win is the first requisite in any contest, and fortunately science

to-day is saying what the inner heart of man must always have told him was true, that a chaste life is both possible and safe. Indeed the scientists of to-day declare it to be advantageous, heightening the power of the individual in all directions, and particularly at the growing age.

Every parent has an ideal as to how he wishes his daughter to be treated by young men, and how he wishes her to conduct herself toward them. That this ideal be reached in the case of the daughter, it is necessary that the son be trained to a chivalry and respect for all women, which will make it impossible for him to take liberties with any woman. A right knowledge of the real meaning and the responsibilities and duties of their lives at this time would be a better safeguard for most young people than any amount of chaperonage. Nor will such training in any way lessen the joy of life, or the charms of courtship, but on the contrary, will enhance all that is most precious.

When the youth goes finally into the real battle of life, into the world of business, of competition, and temptation, he

will need all his fortitude and all his knowledge to guide him aright in his personal life. And then it is that he will begin to realize what his parents have really done for him, and to appreciate their forethought and care. Then, too, he not infrequently expresses in the strongest terms his gratitude to the mother, the father, who have guided his course safely over the dangerous shoals.

The life battle of the youth who has been carefully instructed and preserved clean in mind and body is very different from that of him who has been weakened in will and perverted in mind from lack of such preservation; he knows that purity is both possible and good, and desires it above all things for his sons, both for their happiness and for their material success in life.

Habits of thought and action have an incalculable influence upon the body as well as upon the mind; and here as everywhere else, the ideal, whether it be high or low, will control the destiny of the man.

# LIST OF BOOKS HELPFUL IN STUDYING PLANT AND ANIMAL LIFE

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